









Team Composition

Composite + Positive = Compositive

Vision Statement

"Finding strength in diversity, Compositive pools the talents of an interdisciplinary team with the goal of positively changing the future of the built environment."



com _____.
comfort
community
communication
complexity
compassion
comprehensive
compositive.

Building Team Compositive

7 Graduates
+ 21 Undergraduates

Team Compositive



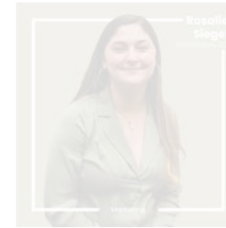
Meet Team Compositive



Faculty Advisors



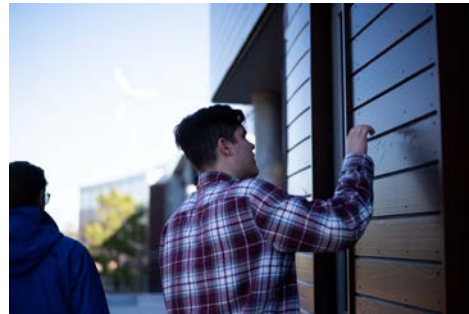
Meet the Leads



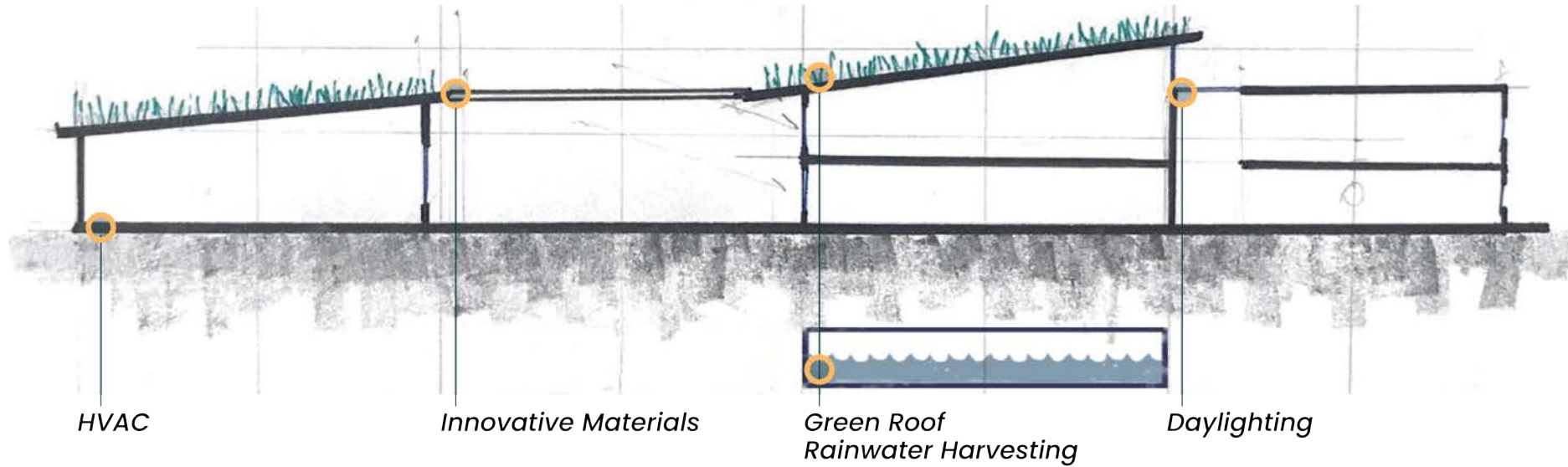
Faculty Advisors



Industry Partners



Living Building Inspiration



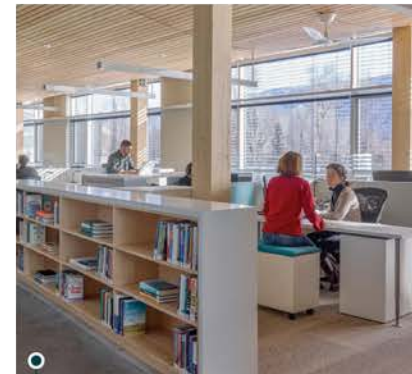
*Sacred Heart
Stevens Library*
Atherton, CA



Co|Lab - HITT
Falls Church, VA

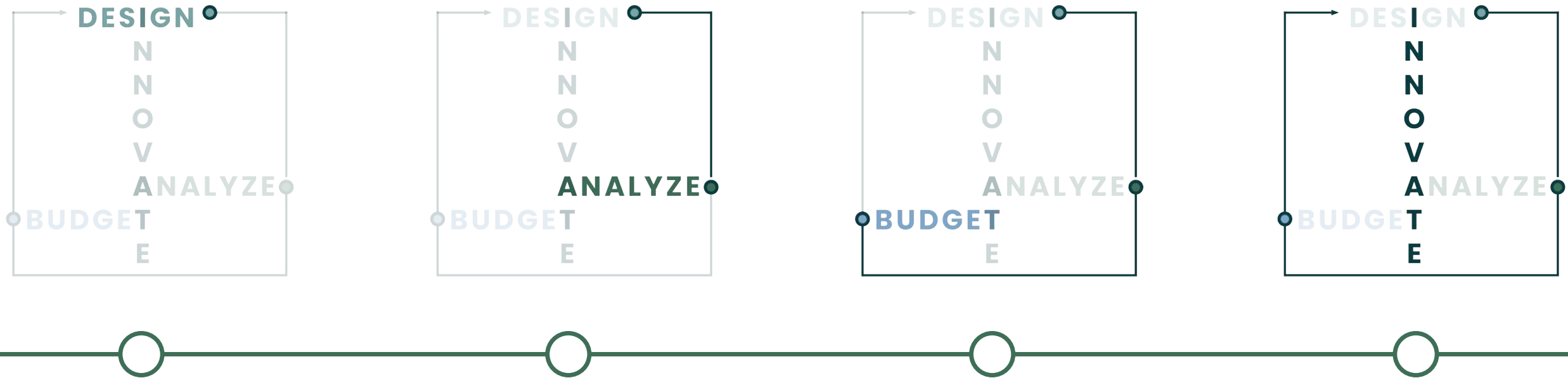


*Brock
Environmental
Center*
Virginia Beach, VA



*Rocky Mountain
Institute HQ*
Basalt, CO

Design Process



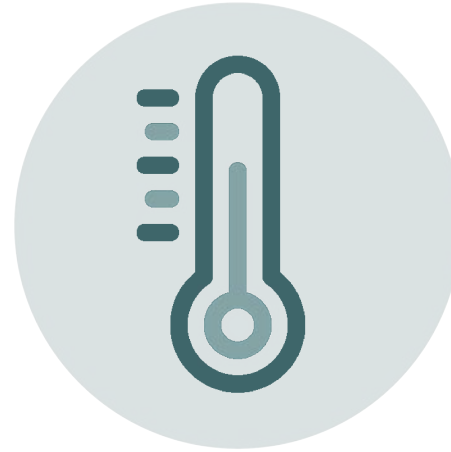
The Four C's [Design Goals]



Conservation



Community



Comfort



Cost Awareness

The Four C's [Design Goals]



Conservation

Preserve Existing
Ecology

Use of Reclaimed
Materials

iTree Analysis

The Four C's [Design Goals]



Conservation

Preserve Existing Ecology

Use of Reclaimed Materials

iTree Analysis



Community

Showcase to School Groups

Encourage Green Communities

Locally Sourced Green Roof

Scenic Walk/Bike Paths

The Four C's [Design Goals]



Conservation

Preserve Existing Ecology

Use of Reclaimed Materials

iTree Analysis



Community

Showcase to School Groups

Encourage Green Communities

Locally Sourced Green Roof

Scenic Walk/Bike Paths



Comfort

Individual Thermal Zones

Low Velocity HVAC

Radiant Floors

Natural Daylighting

Material Selection

The Four C's [Design Goals]



Conservation

Preserve Existing Ecology

Use of Reclaimed Materials

iTree Analysis



Community

Showcase to School Groups

Encourage Green Communities

Locally Sourced Green Roof

Scenic Walk/Bike Paths



Comfort

Individual Thermal Zones

Low Velocity HVAC

Radiant Floors

Natural Daylighting

Material Selection

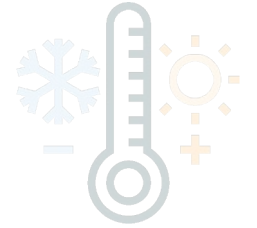
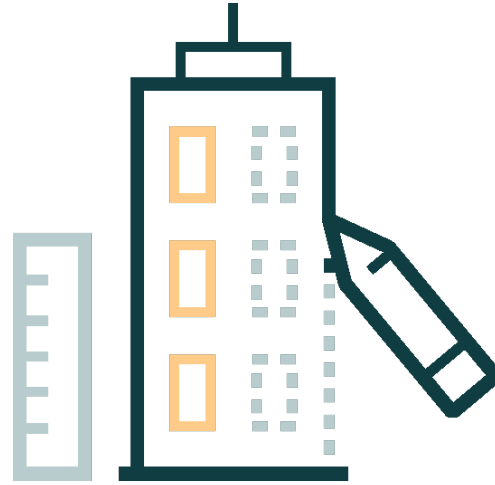


Cost Awareness

Intelligent Constructability

Financially Attainable

Low Operational Costs



Introduction

Architecture

Comprehensive Plan
Crafted Views
Biophilic Design
Organic Materials
Accessibility
Public and Private

Comfort & Environmental

Community Connections

Trails link to local schools



Connect to cutting edge landfill facilities



Provide rich outdoor learning environments



Backbone of Eco-Park



Place
Petal

Pedestrian – oriented community encourages reduced use of vehicular transportation.

Comfort & Environmental

Engineering

Operations

Energy Performance

Resilience

Market Potential

Financial Feasibility & Affordability

Innovation

Site Masterplan

Comfort & Environmental

Engineering

Operations

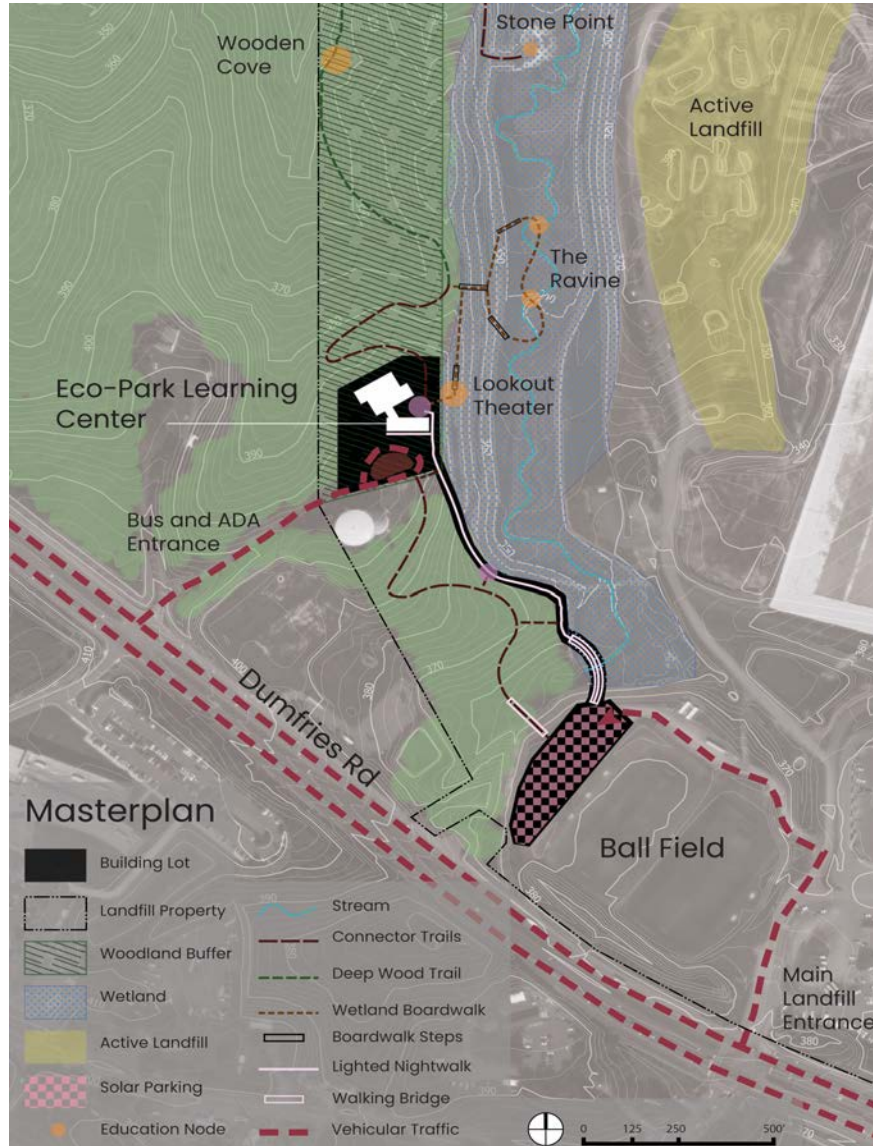
Energy Performance

Resilience

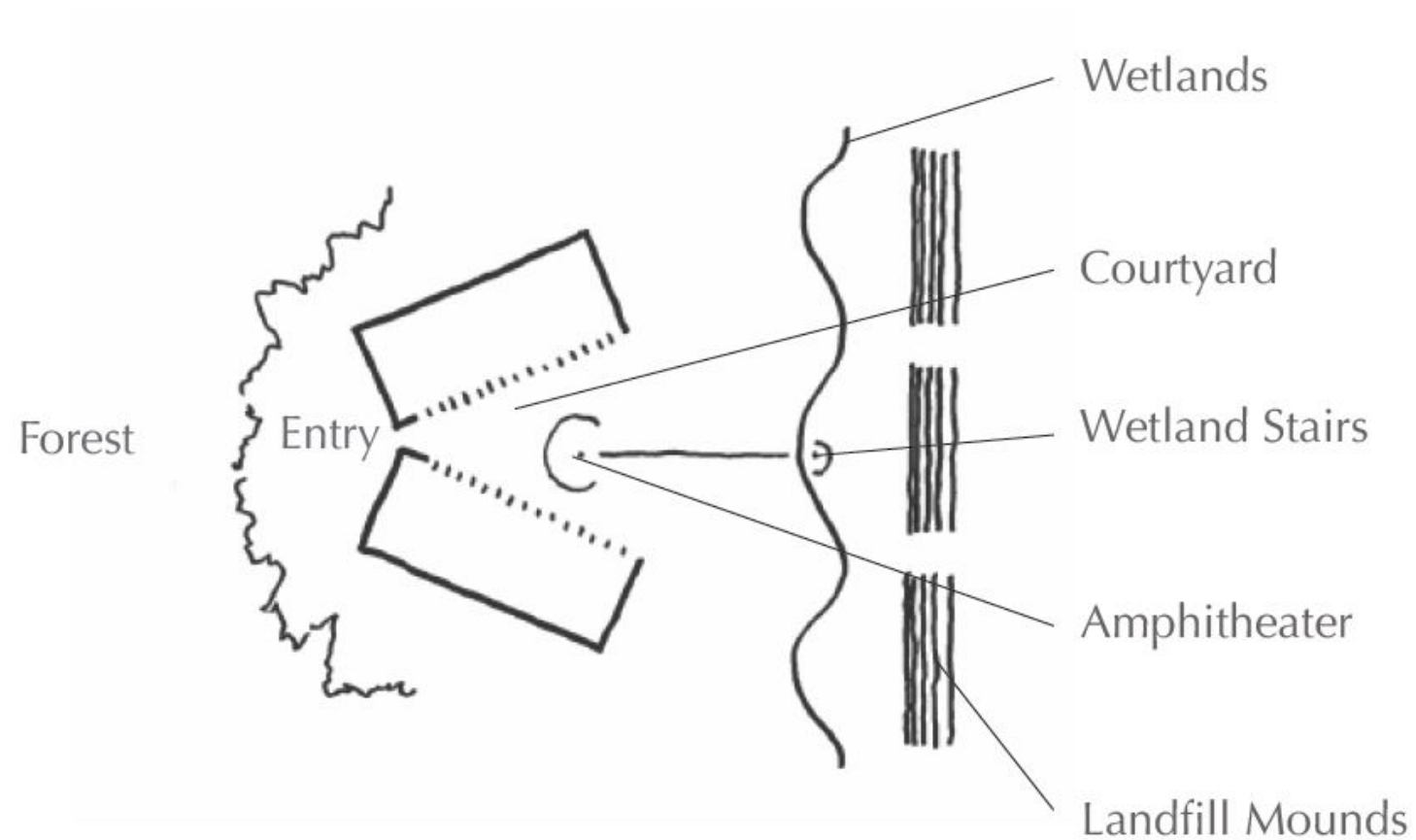
Market Potential

Financial Feasibility & Affordability

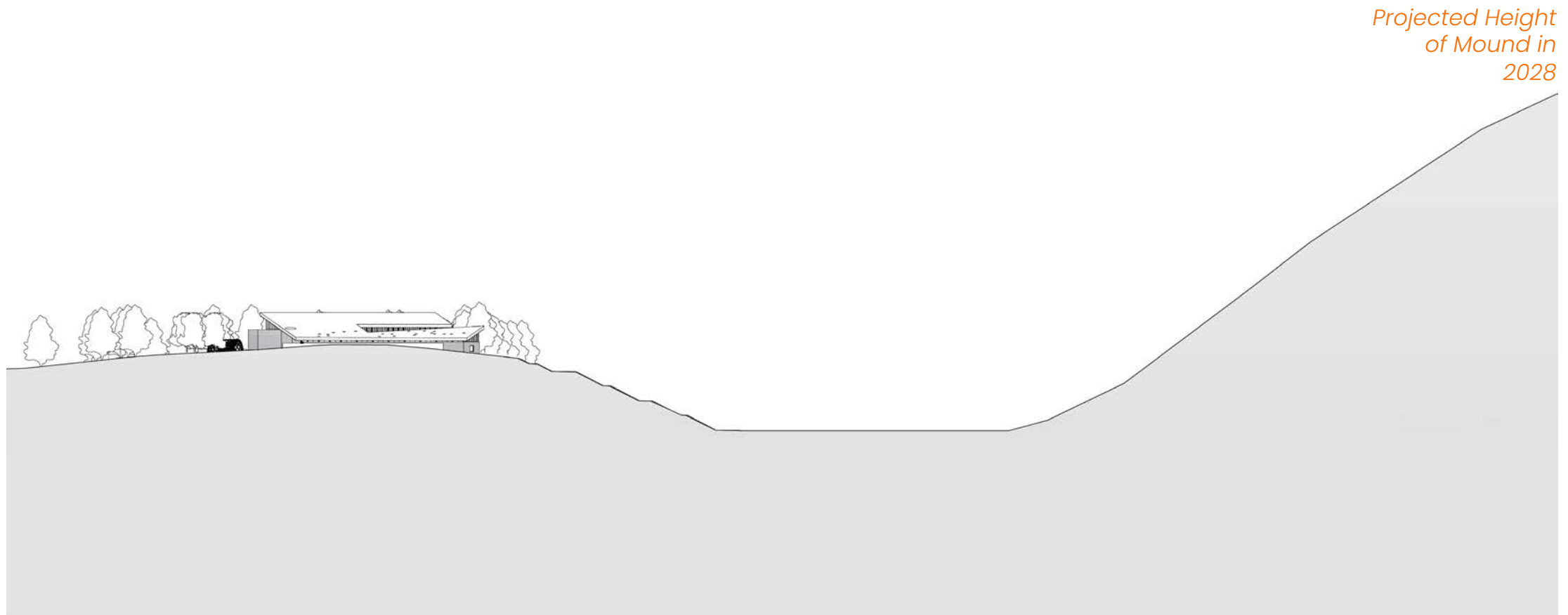
Innovation



Form Generation



An Everchanging View



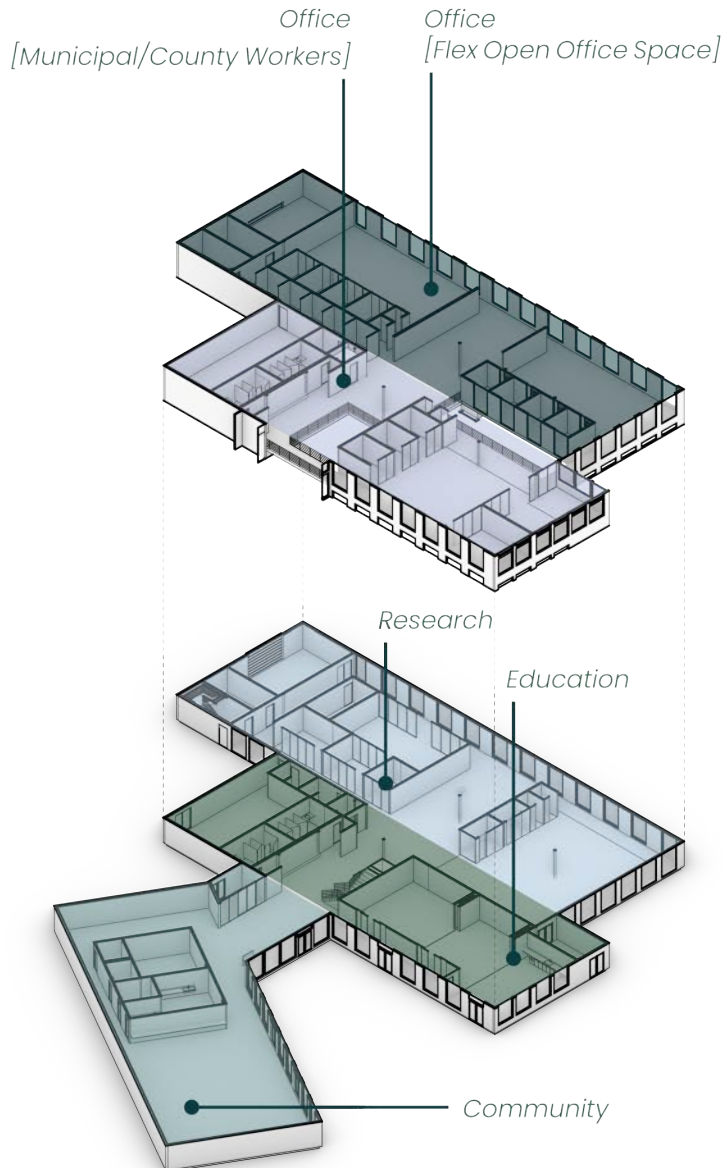
A Building That "Isn't There"



Sequencing



Spatial Planning



Research

General Lab Equipment
Horticultural/Ecological Studies
"Live-In" Residence Programs
Mudroom

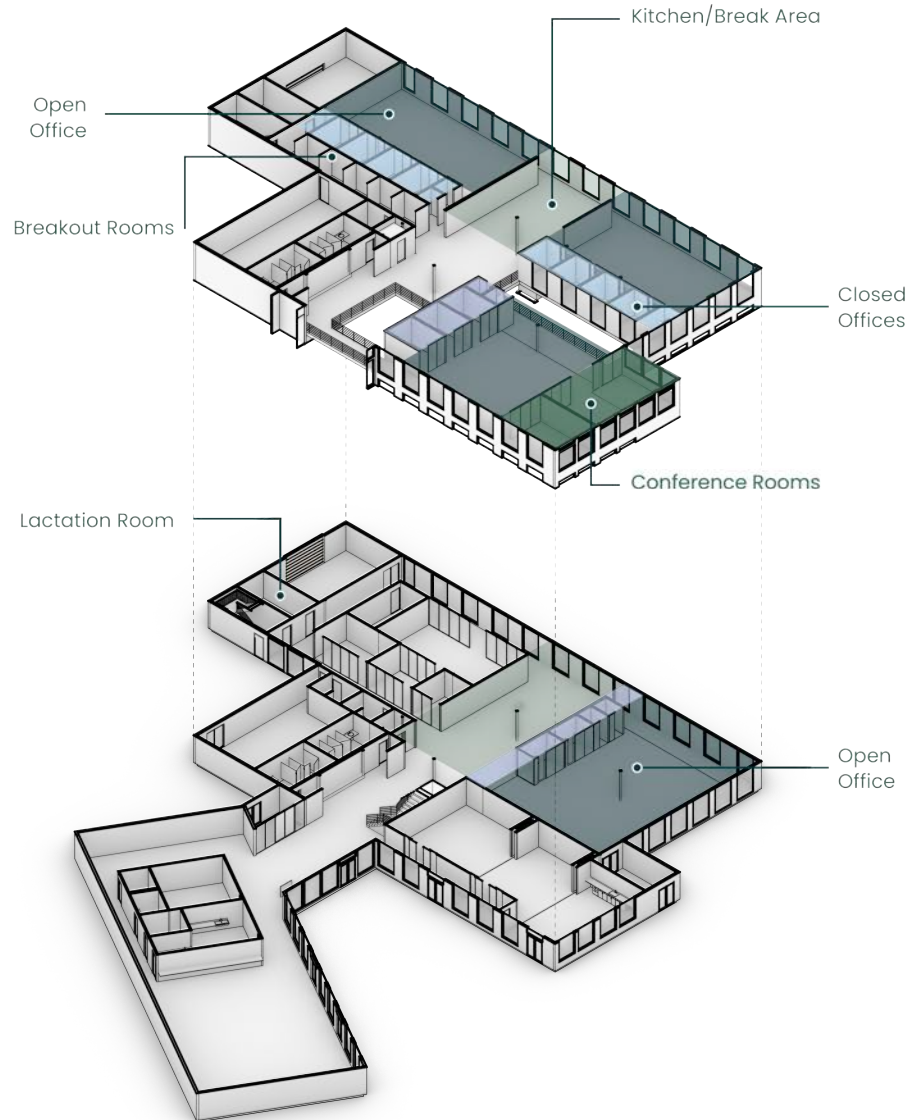
Education

3 Multipurpose Rooms
Outdoor Learning Areas
[Growing Beds, Woodland Buffer, Wetland]

Community

Outdoor Gathering Spaces
Indoor Gathering Spaces
[with Kitchen/Bar and Presentation Equipment]

Office Amenities



Open Office

Rentable office space for various tenants

Closed Office

10 Closed offices for Administration

Kitchen & Break Area

Located centrally to promote healthy eating and working habits

Conference Rooms

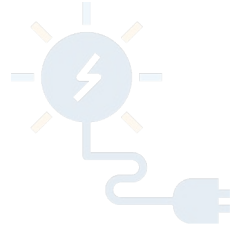
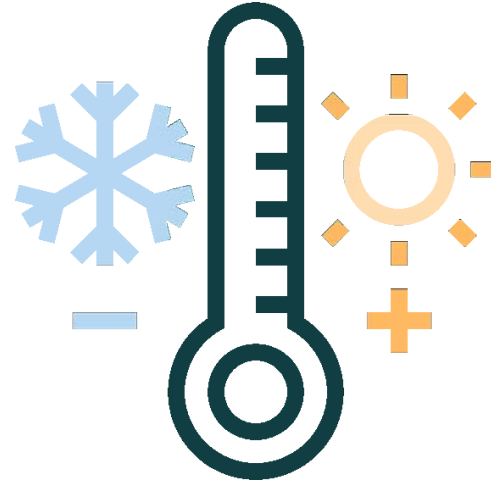
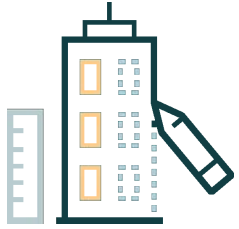
3 various sizes [2 located on the second floor]

Breakout Rooms

Provides secluded & sound-proof space for tenants to work

Lactation Room

Provides needed privacy for mothers



Architecture

Comfort & Environmental

Engineering

Glare Reduction
Individual HVAC Controls
Low Velocity Airflow
Mechanical Noise Reduction
Fresh Air Circulation

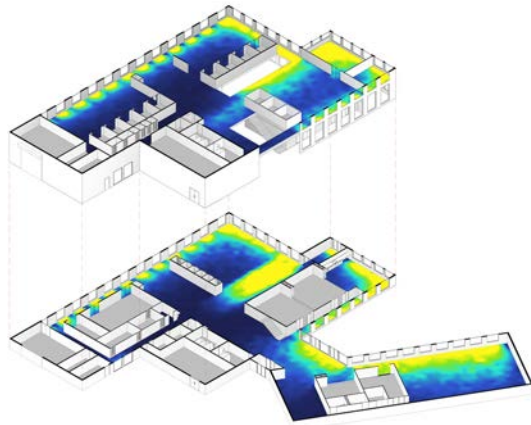


Generous Daylighting

Skylight

Lighter Surfaces
Reflect Light

Task Lighting for
Open Office





Quality Acoustics



QRD Ceiling Panels

QRD Wall Panels



Quality Acoustics



Acoustic Partitions

Recycled Carpet

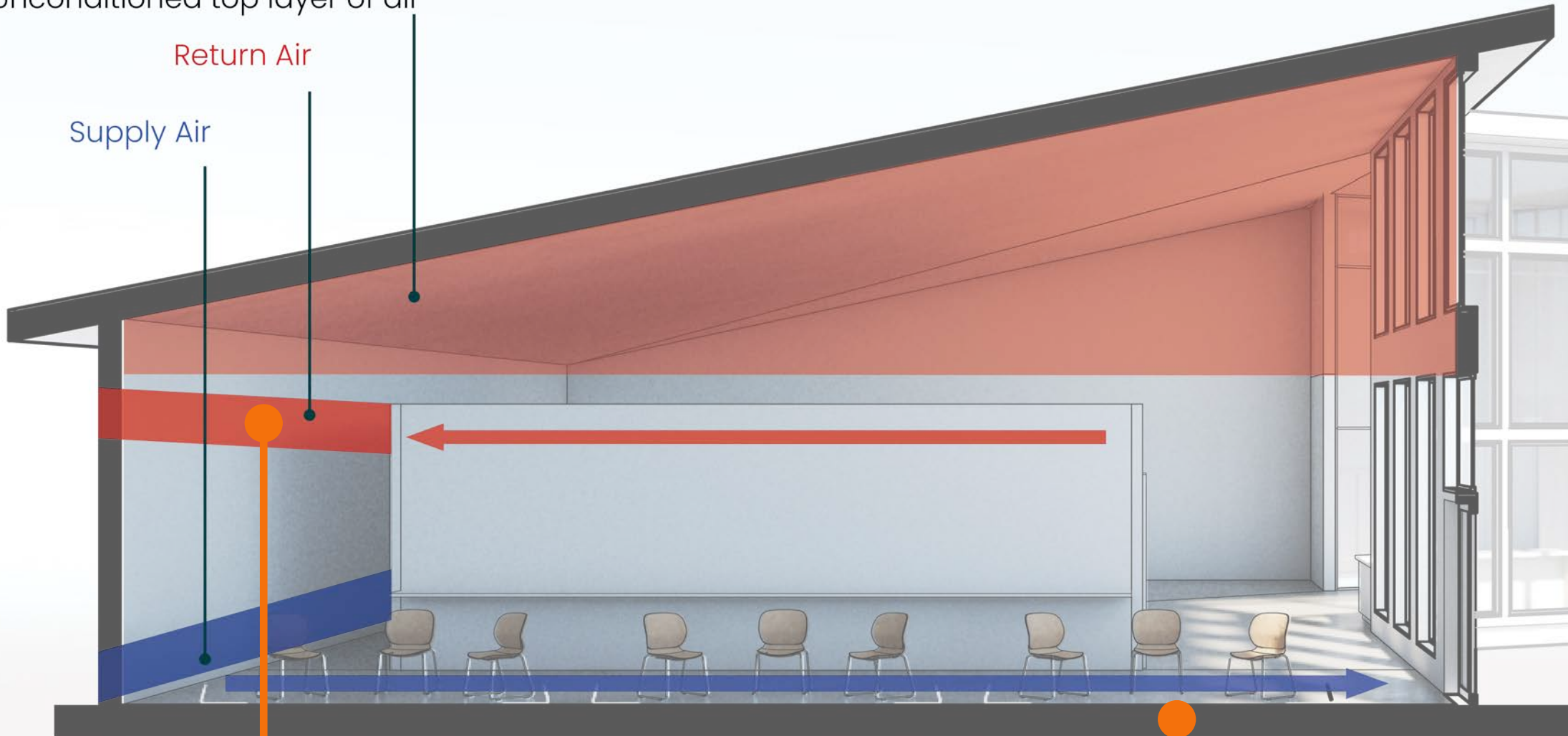
Quiet Mechanical Systems



Unconditioned top layer of air

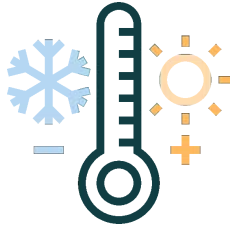
Return Air

Supply Air

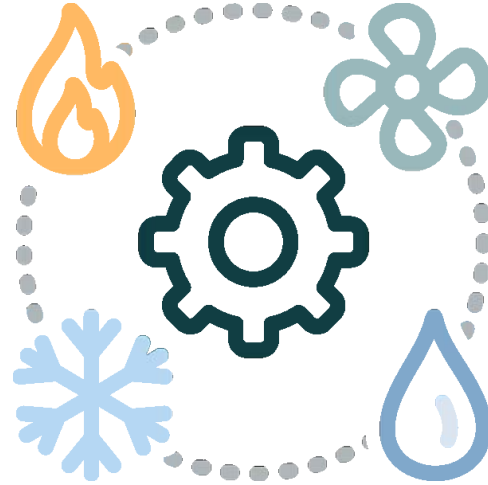


Low Velocity
Displacement System

Hydronic Radiant
Heated Floor

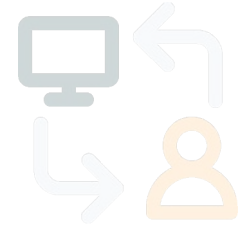


Comfort & Environmental



Engineering

High Performance Enclosure
Occupancy Sensors
Composting Toilets
4-Pipe Fan Coil Units
Hydroponic Radiant Heating
Displacement Ventilation



Operations

Architecture

Comfort &
Environmental



Operations

Energy
Performance

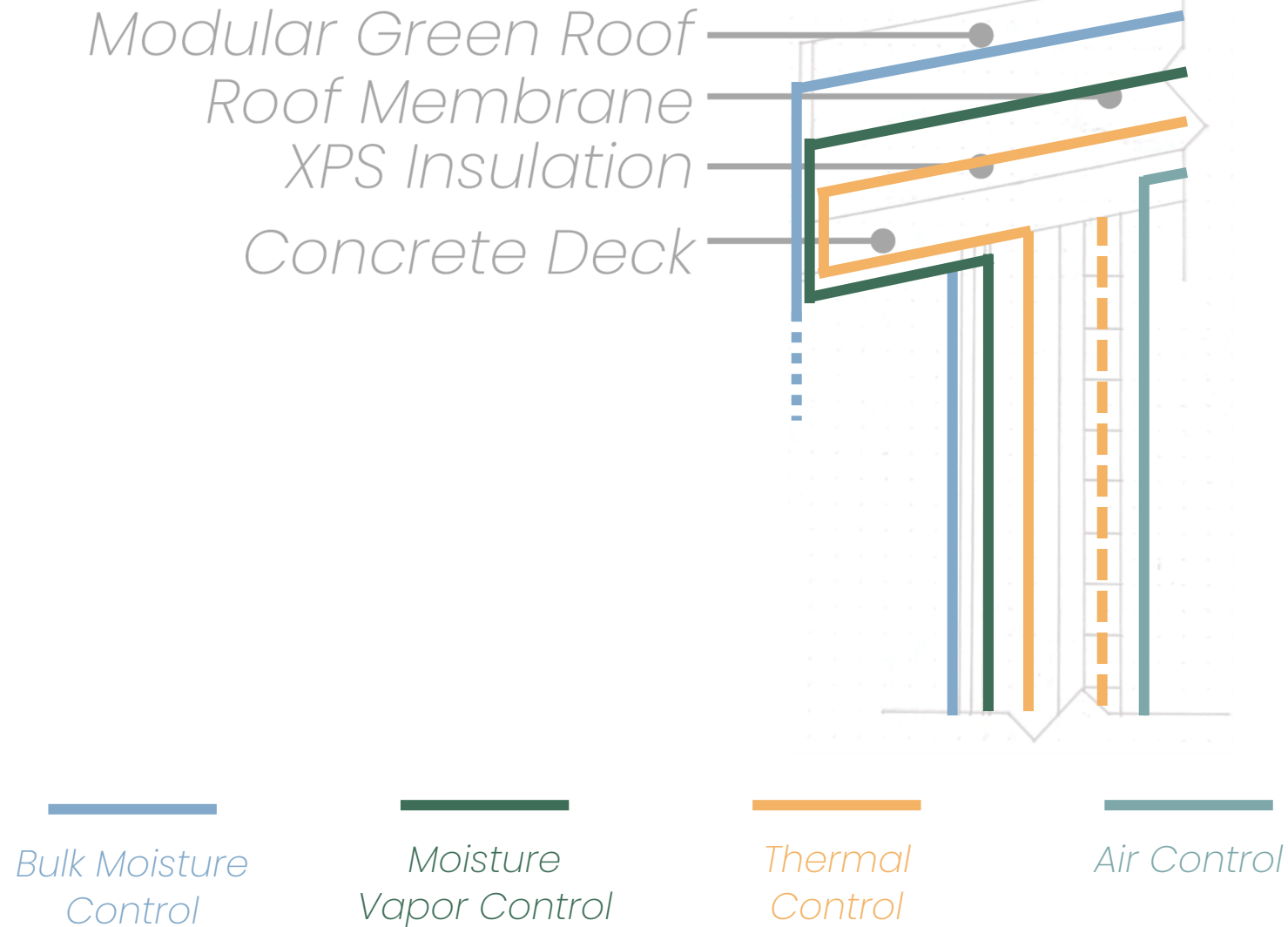
Resilience

Market
Potential

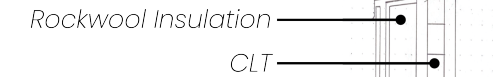
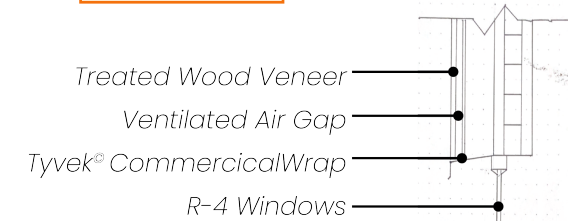
Financial
Feasibility &
Affordability

Innovation

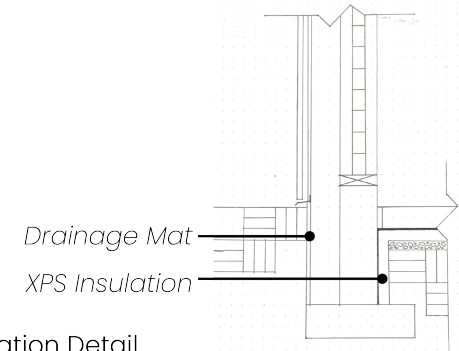
Building Enclosure



Roof Detail

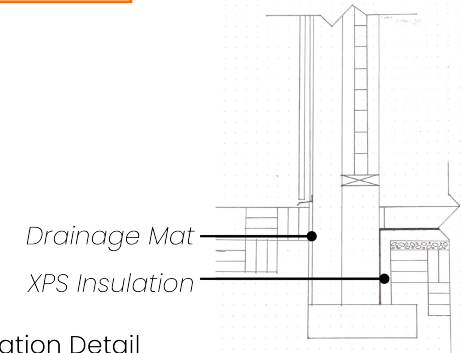
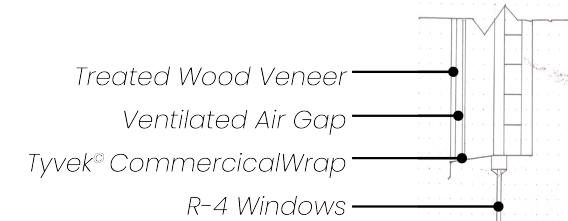
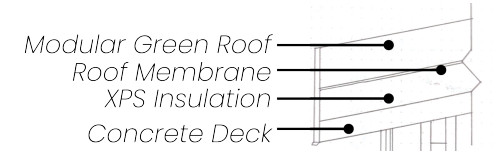
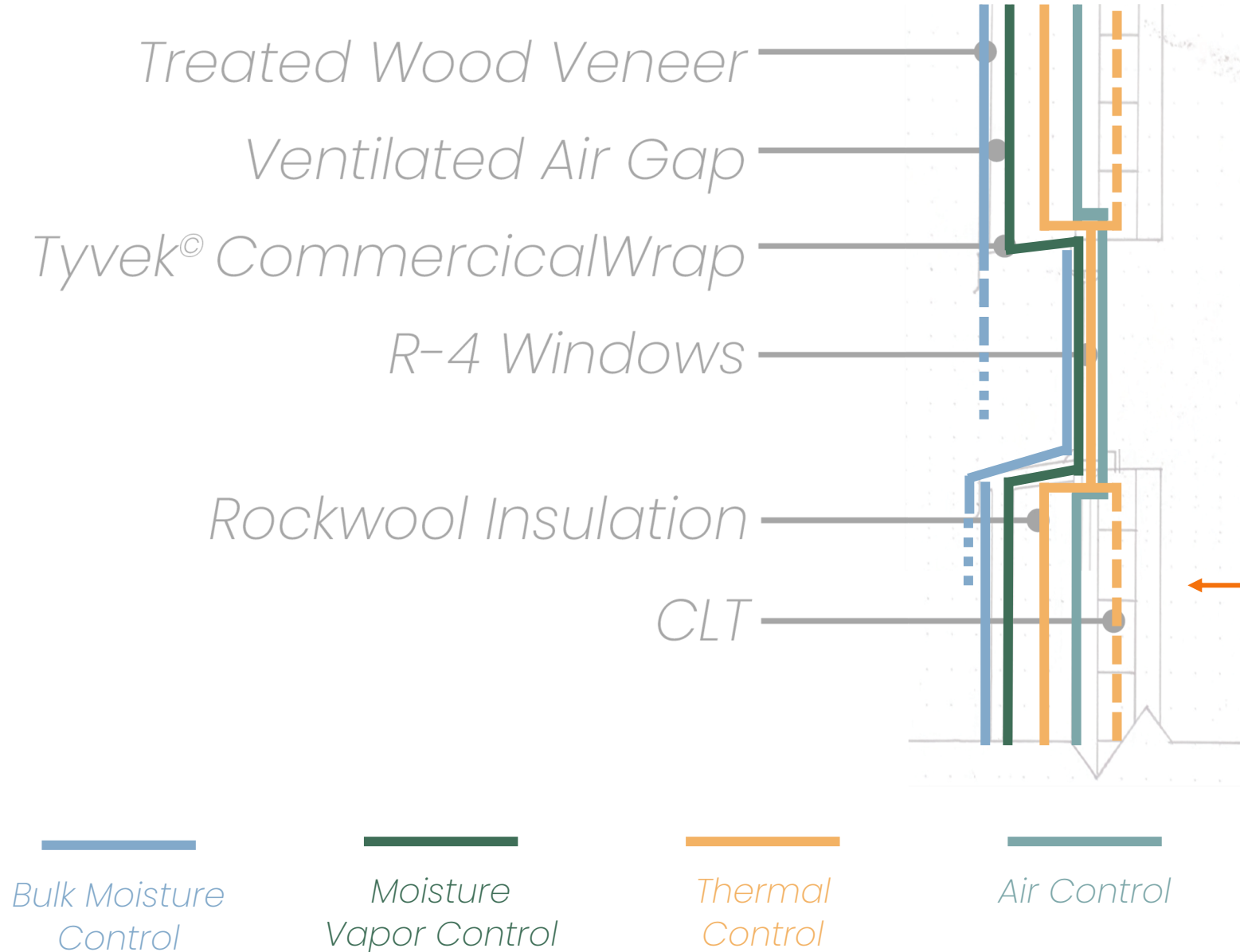


Window Detail

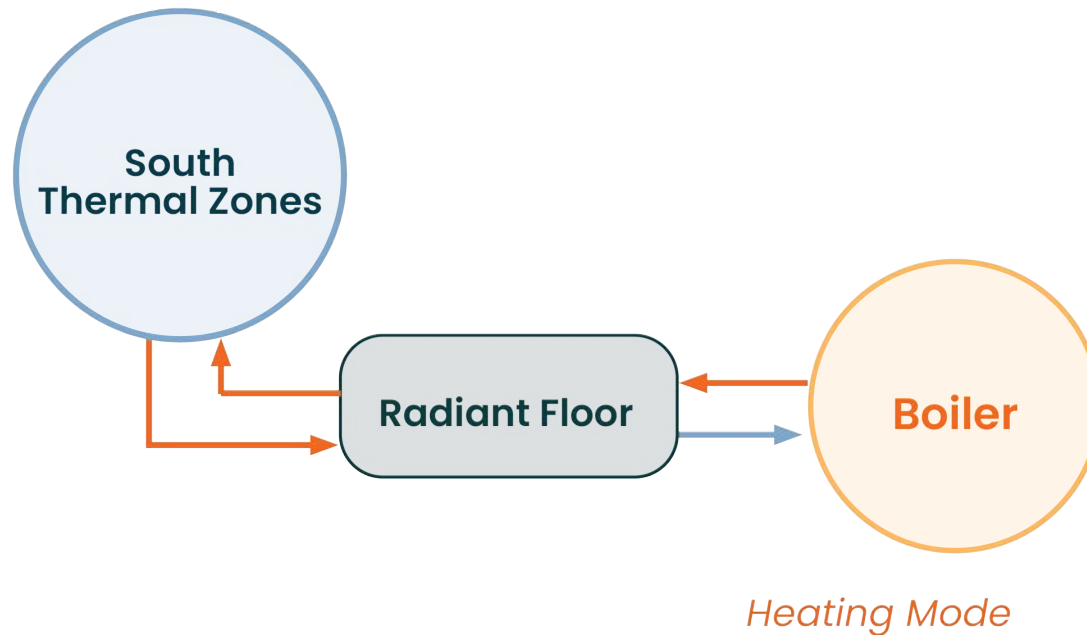


Foundation Detail

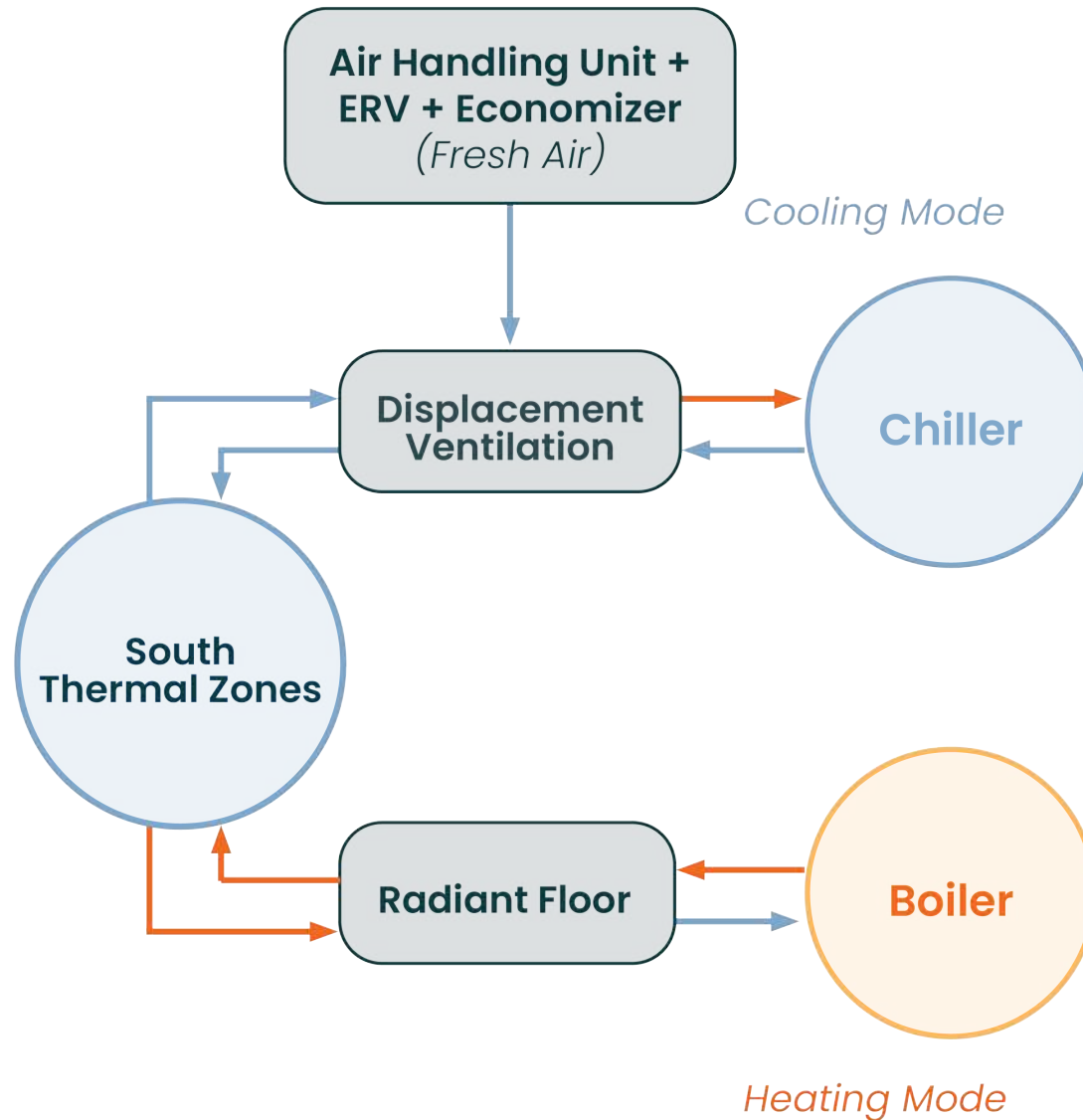
Building Enclosure



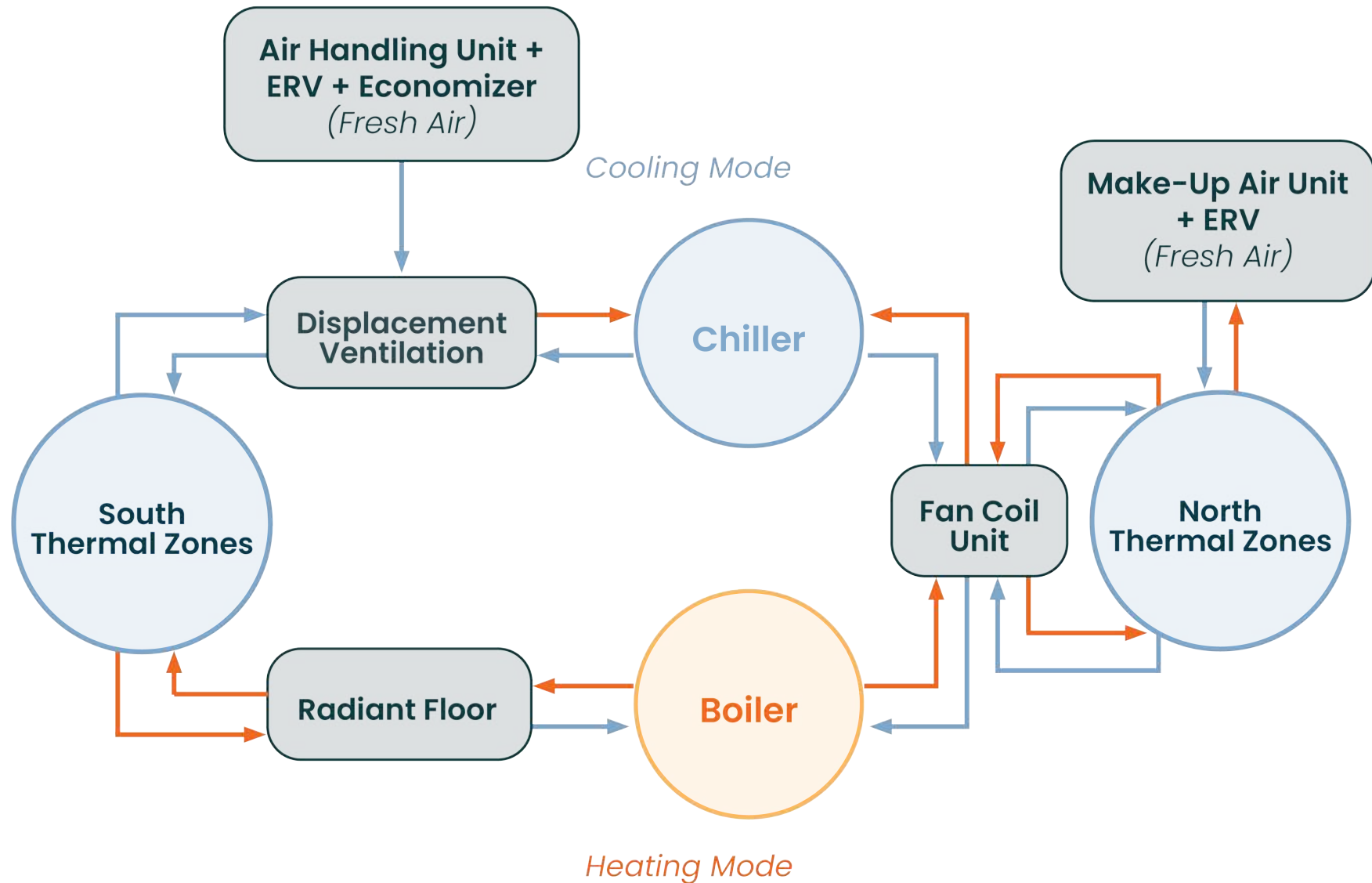
Mechanical Systems Flow Diagram



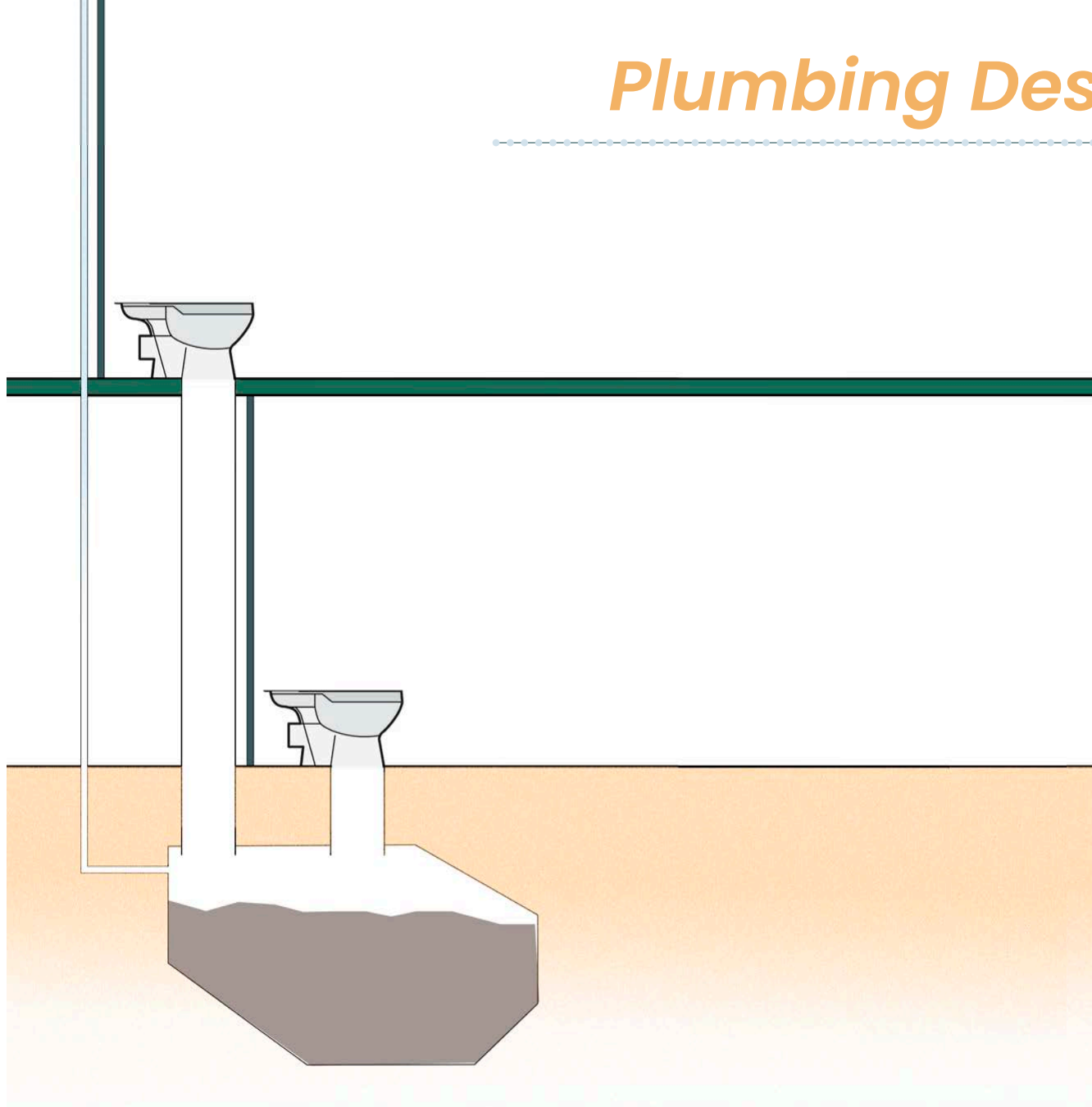
Mechanical Systems Flow Diagram



Mechanical Systems Flow Diagram



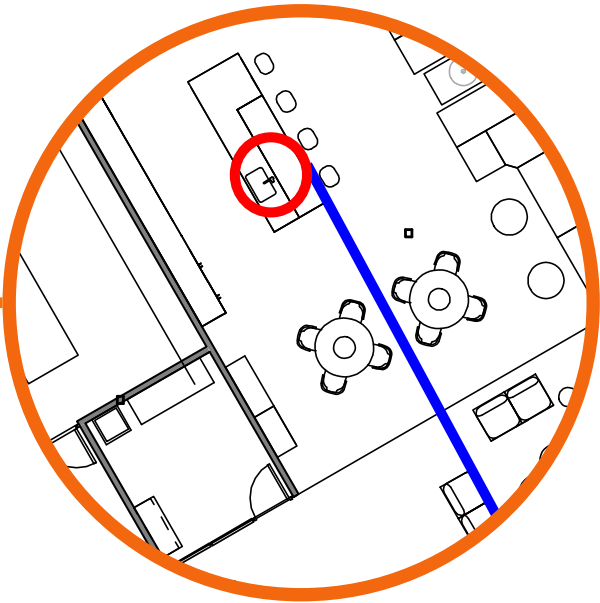
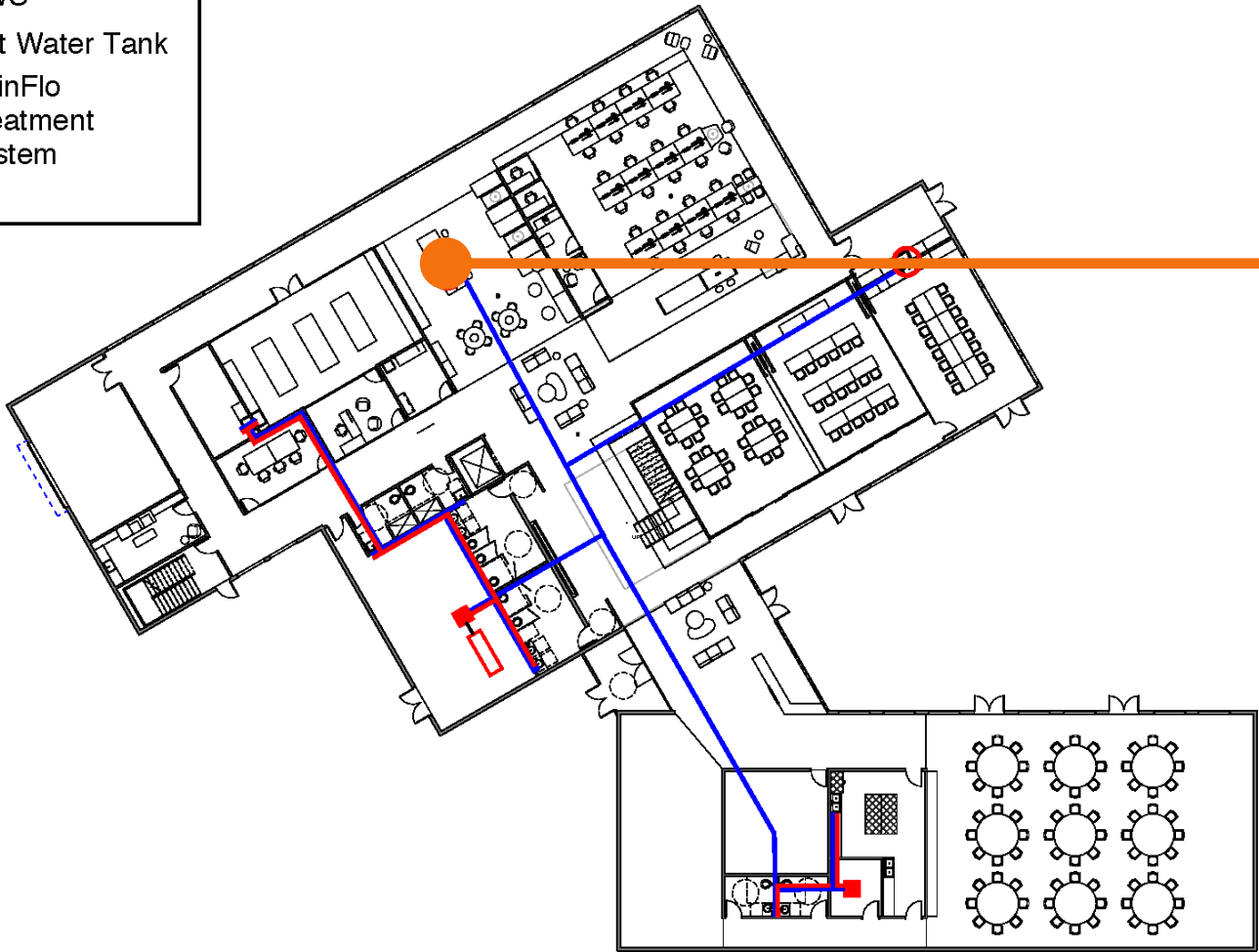
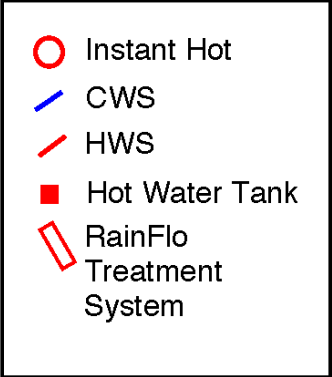
Plumbing Design



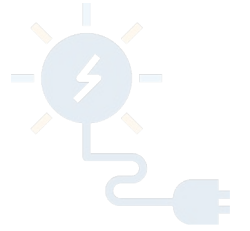
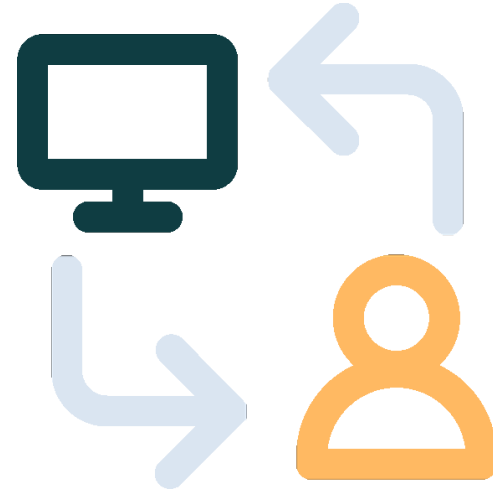
Water
Petal

Composting toilets
reduce water
demand by 50,000
gal., making Water
Petal certification
feasible.

Plumbing Layout



Instantaneous Hot Water
Heater Location



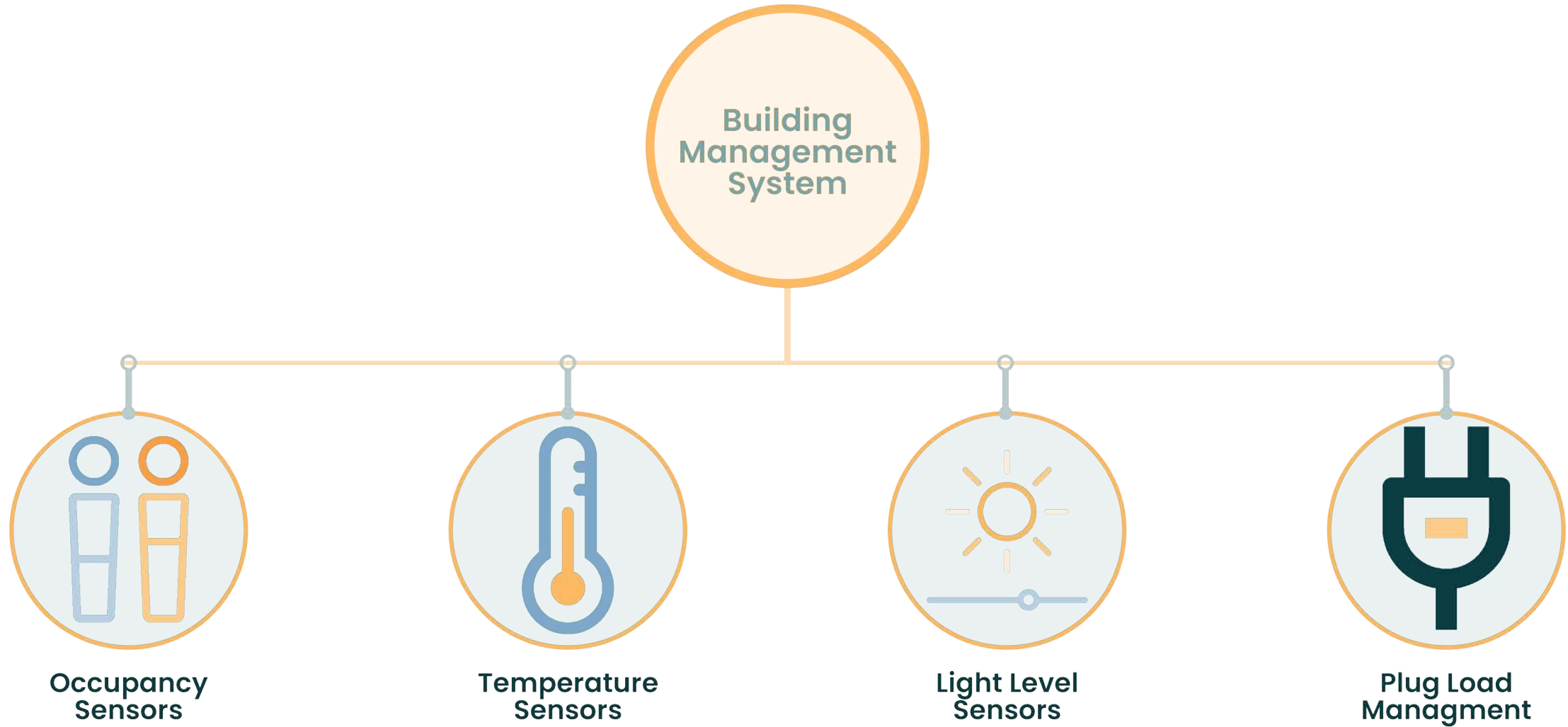
Engineering

Operations

**Energy
Performance**

Building Management System
Dormant Energy Reduction
Smartwall

Building Management System



Architecture

Comfort &
Environmental

Engineering



Energy
Performance

Resilience

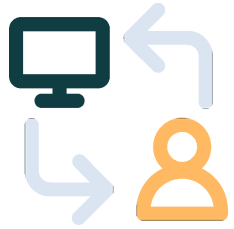
Market
Potential

Financial
Feasibility &
Affordability

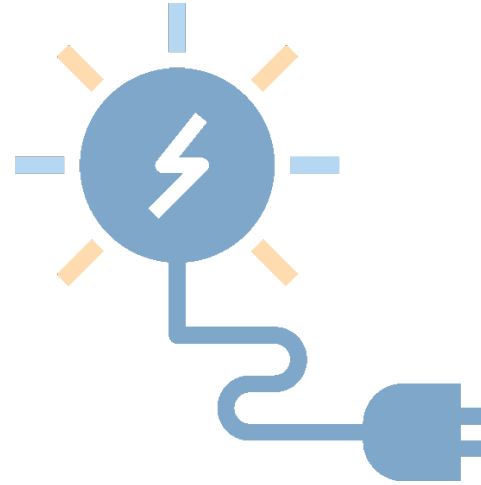
Innovation

Smart Wall

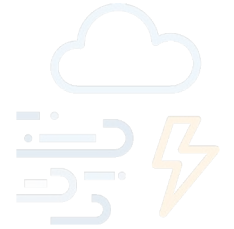




Operations



**Energy
Performance**



Resilience

105% PV Energy Generation.
iTree Analysis.
Plug Load Controls

Solar Array Parking Area

- Retrofit & Reuse of an Existing Ballfield
- + 110 kW solar array from SunPower
- Regulates car temperature
- + 5-minute walk to the Learning Center

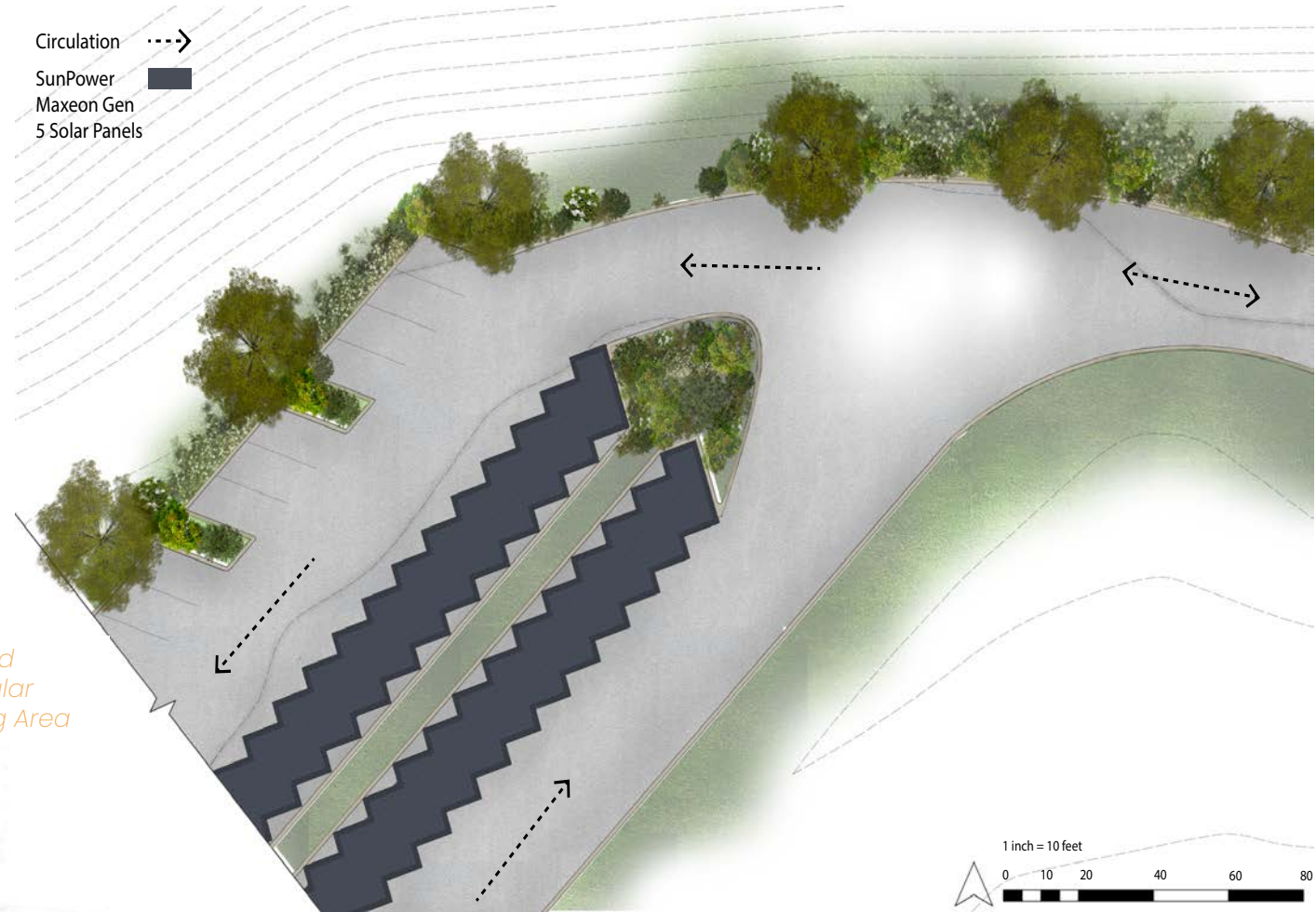
South Facing Solar Canopy

Rain Garden & Vegetation Buffer

Shaded Vehicular Parking Area

Existing Parking Lot

Circulation
SunPower
Maxeon Gen
5 Solar Panels



1 inch = 10 feet
0 10 20 40 60 80

iTree Analysis

iTree Average Annual Benefits (First Year)

Stormwater Services
\$26
Air Quality Benefits
\$43
Carbon Dioxide Sequestration
\$564
Summer Energy Savings
\$344
Winter Energy Savings
\$1343

Total Energy Savings
\$1687

Net Benefits
\$2321



Energy
Petal

Tree shading
passively reduces
the energy
demand of the
Eco-Park Learning
Center.



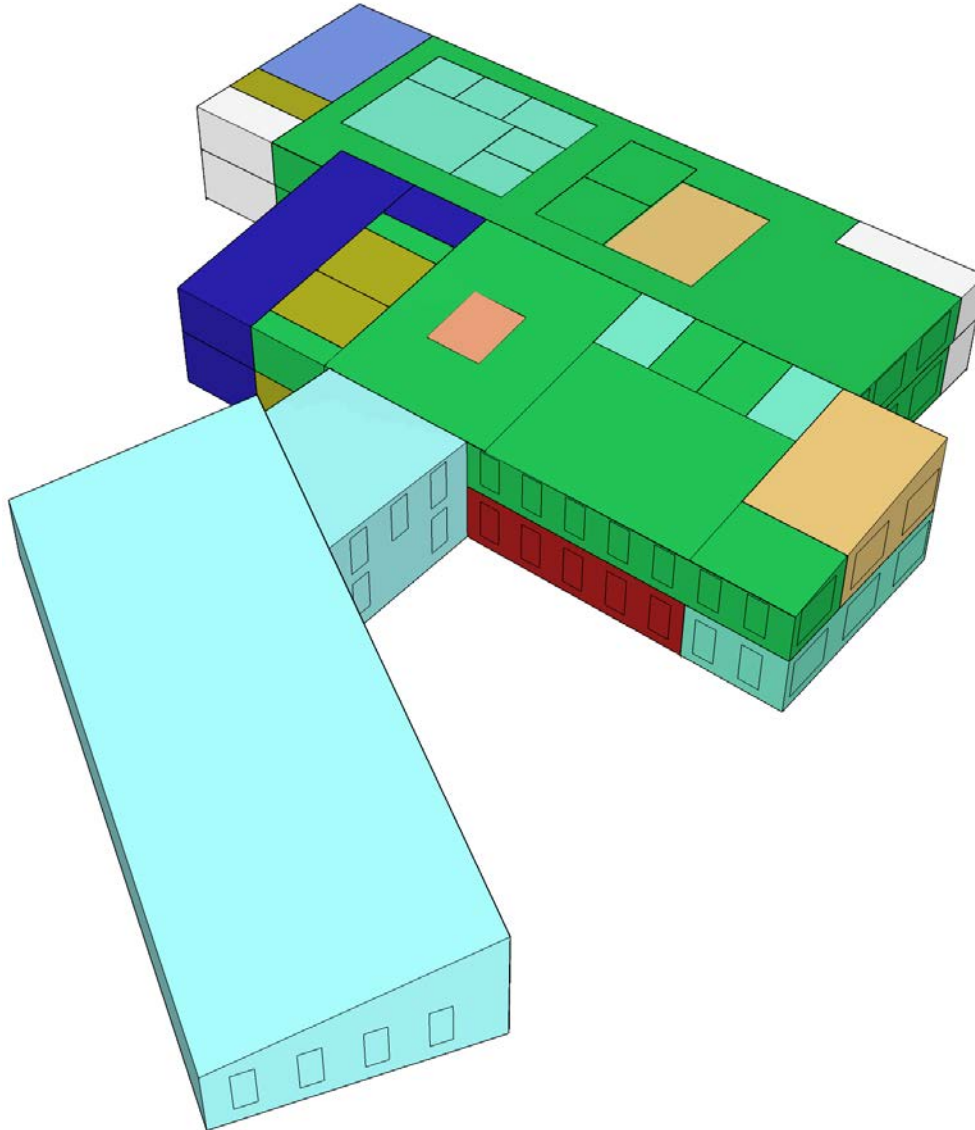
Tree Preservation

Less Desireable



More Desireable

OpenStudio Analysis



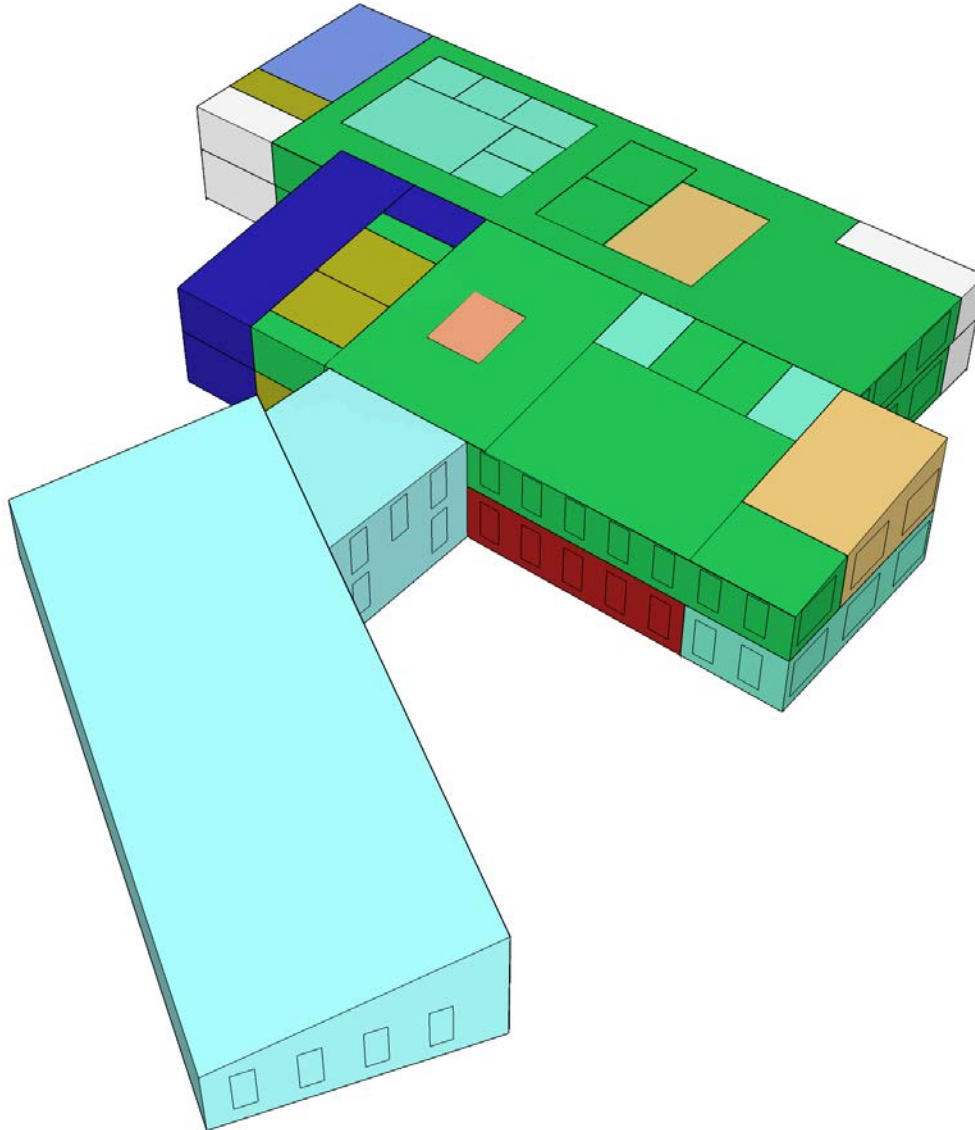
Iteration #1: [Baseline Model]

ASHRAE 189.1-2009 Standard
Construction Sets

10 Thermal Zones

Source EUI: 92.5 kBTU/ft²

OpenStudio Analysis



Iteration #1: [Baseline Model]

ASHRAE 189.1-2009 Standard
Construction Sets

10 Thermal Zones

Source EUI: 92.5 kBTU/ft²

Iteration #2:

Four-Pipe Fan Coil System

17 Thermal Zones

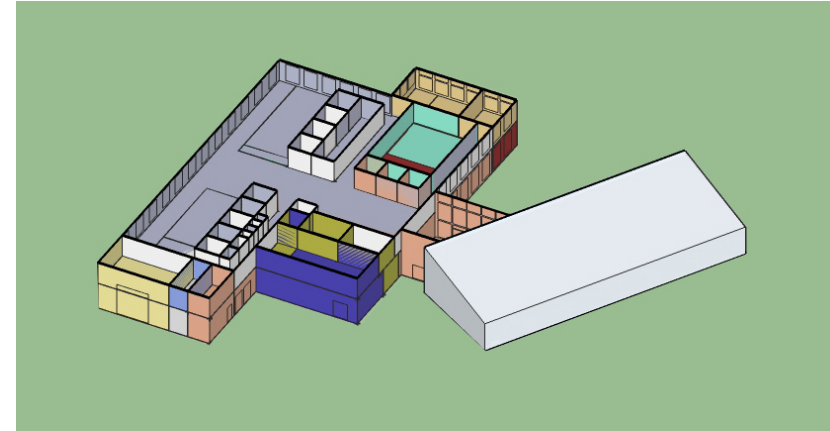
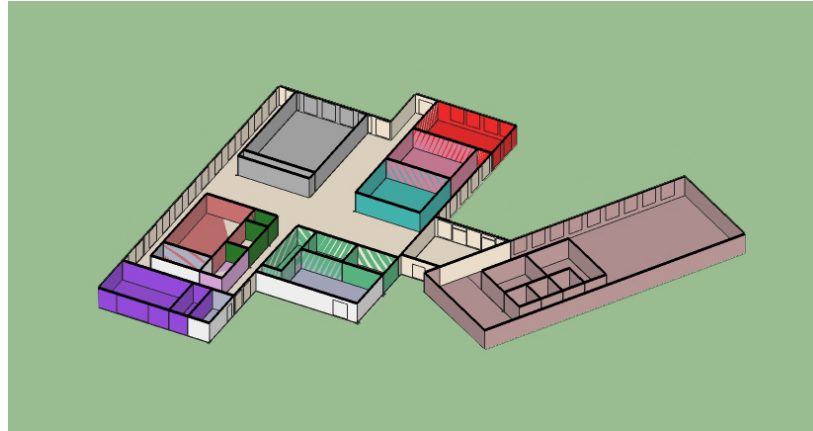
Source EUI: 41.3 kBTU/ft²

OpenStudio Analysis

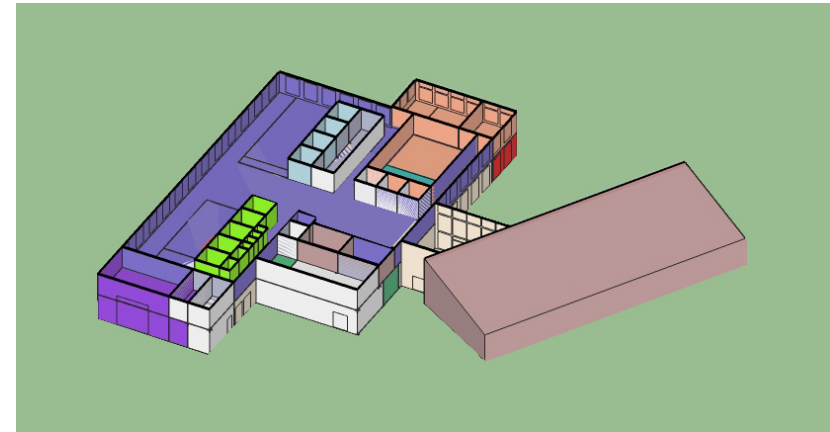
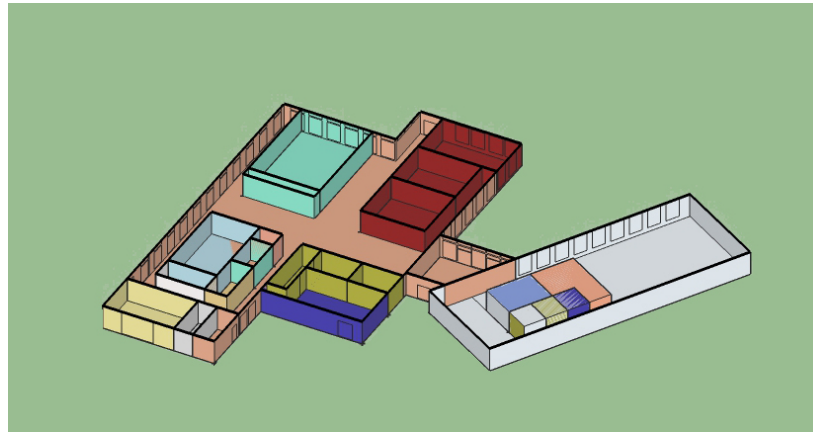
First Floor

Second Floor

Space Types



Space Types



R-33 Walls

+

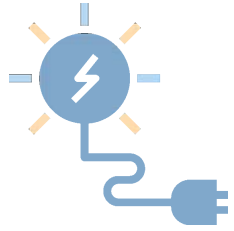
R-40 Roof

+

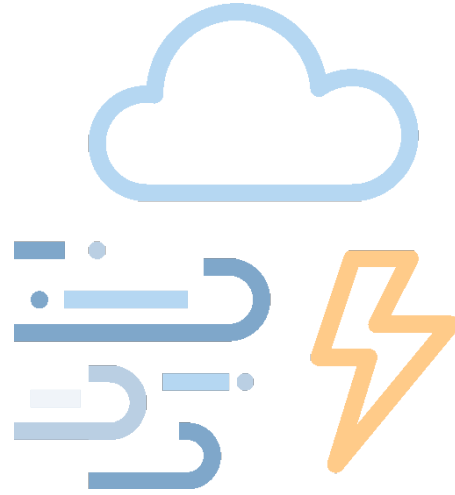
R-10 Slab

=

Source EUI:
39.5 kBTU/ft²



Energy Performance



Resilience

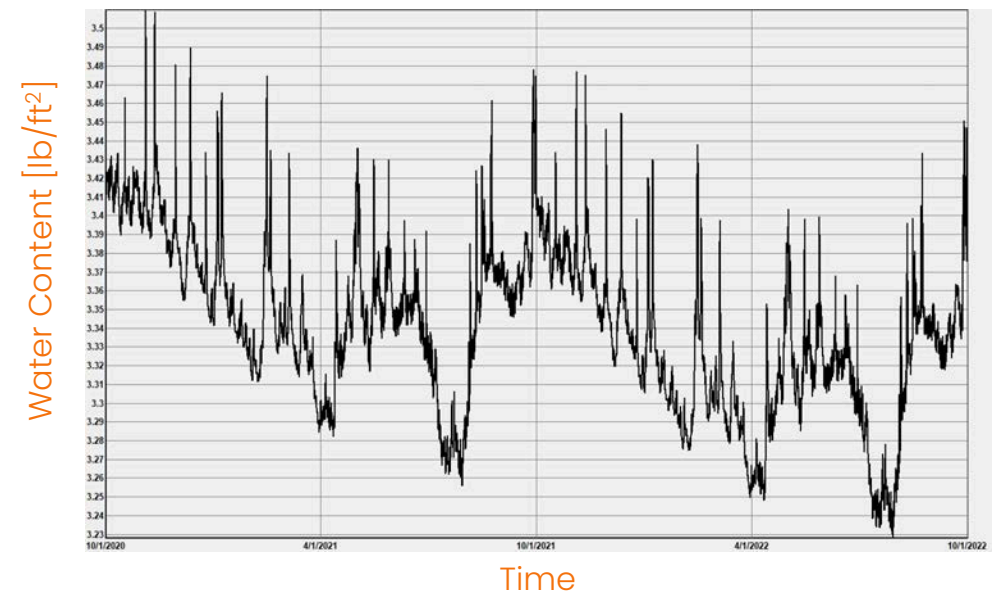
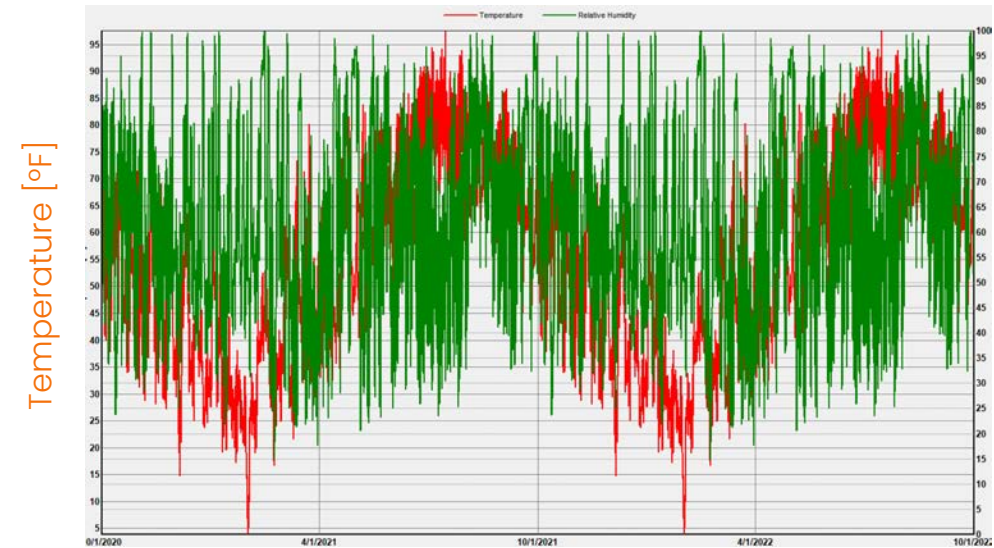
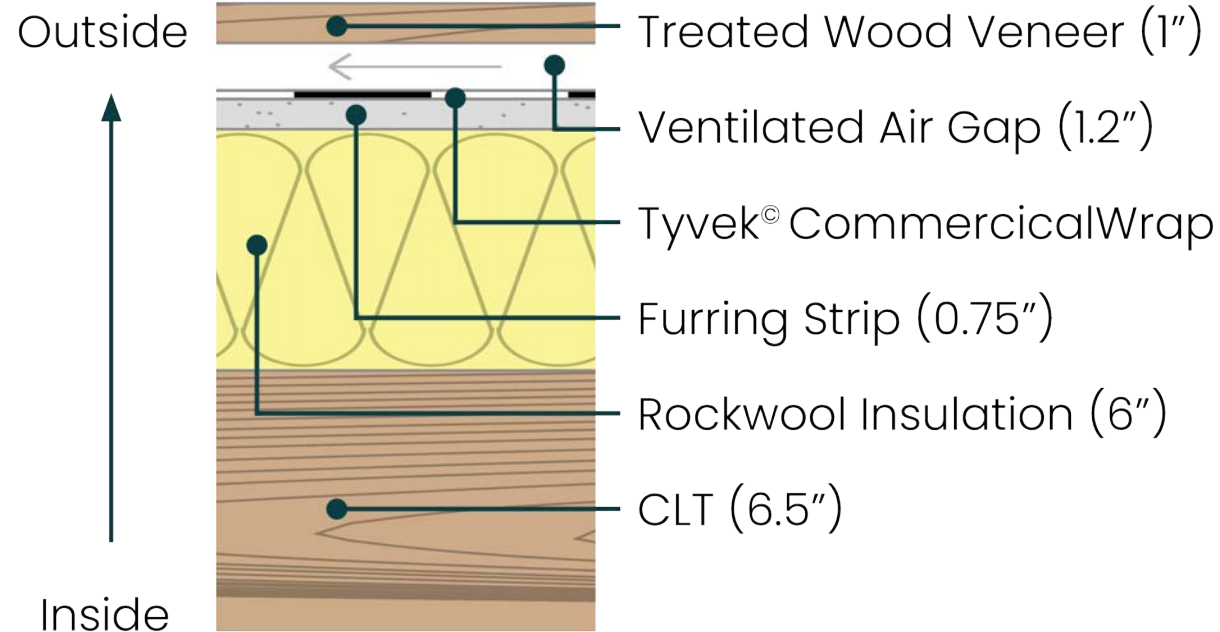
Building Envelope
Site Resiliency
Food Production
Rainwater Harvesting



Financial Feasibility & Affordability

Building Envelope

CLT Wall Section



Architecture

Comfort &
Environmental

Engineering

Operations

Energy
Performance

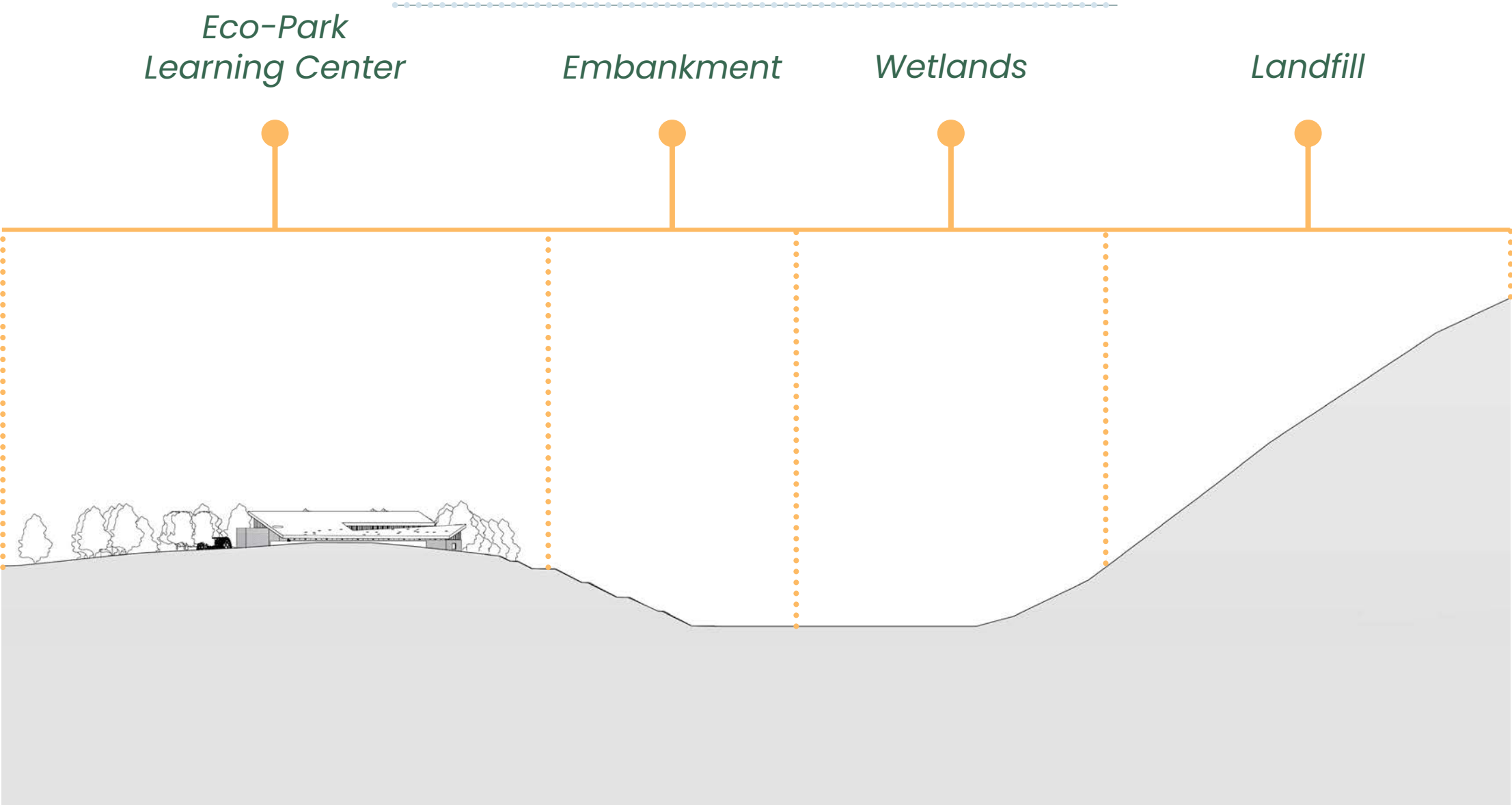


Market
Potential

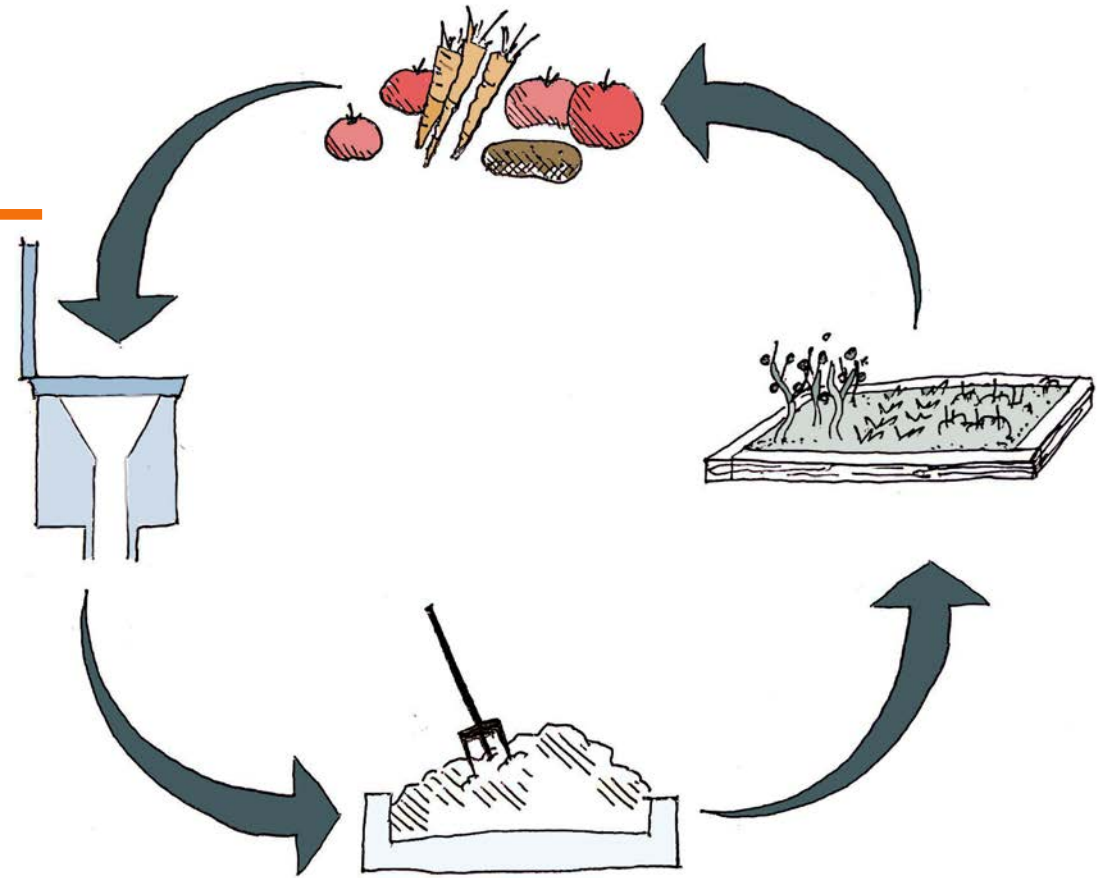
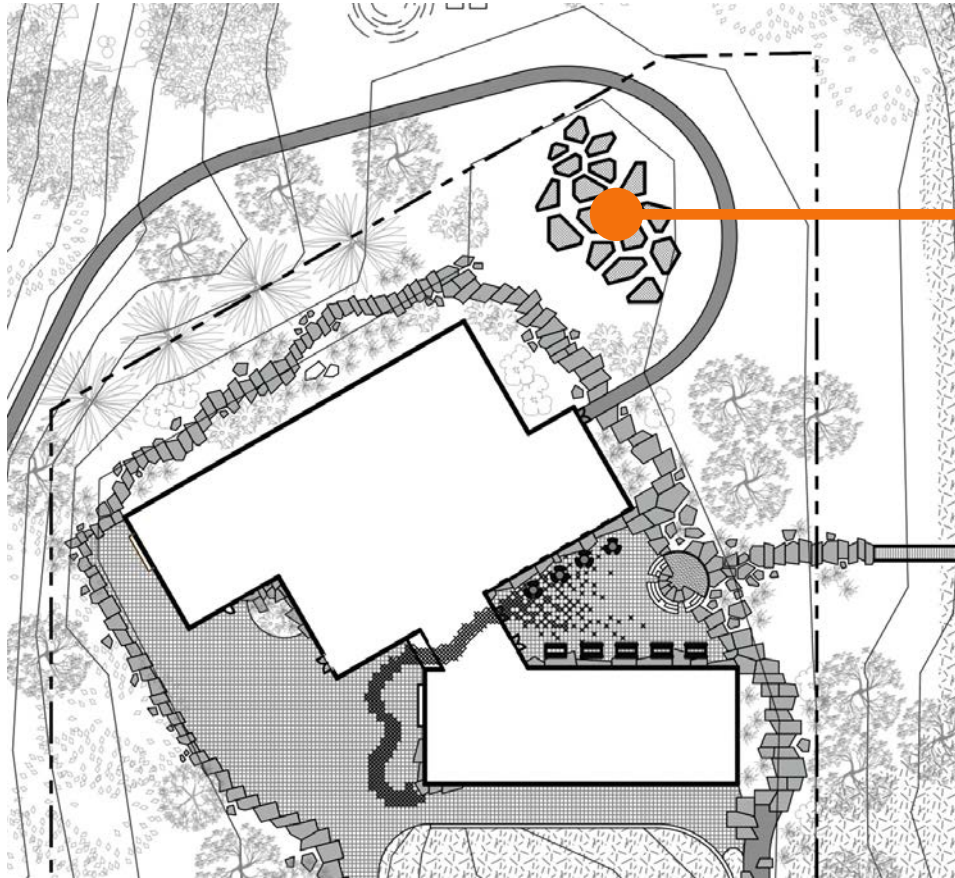
Financial
Feasibility &
Affordability

Innovation

Site Resiliency



Food Production



1,000 sq. ft. of growing beds

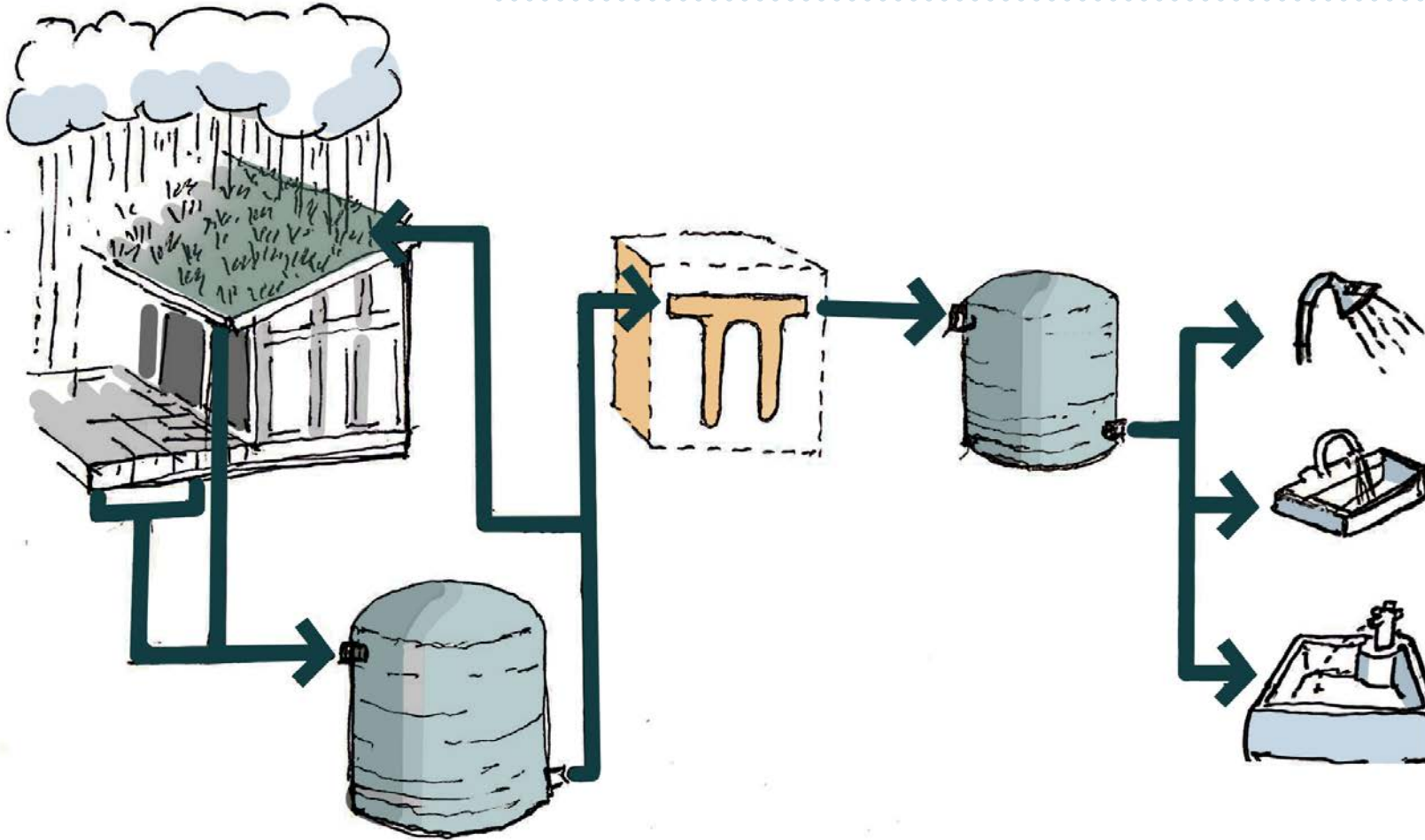


500 lbs. of produce / year



Protection in case of
supply chain disruption

Rainwater Harvesting



Captures over
316,000 gallons
per year

+

Two cisterns:
Green Roof Irrigation
& Potable Uses

+

RainFlo purification
system

=

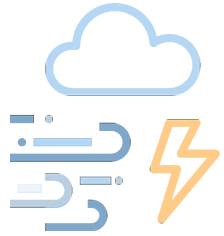
125,000 gallons
potable water
available annually



Water
Petal

.....

100% of the
building's water
needs are
supplied by
harvested and
purified
rainwater.



Resilience



Market Potential

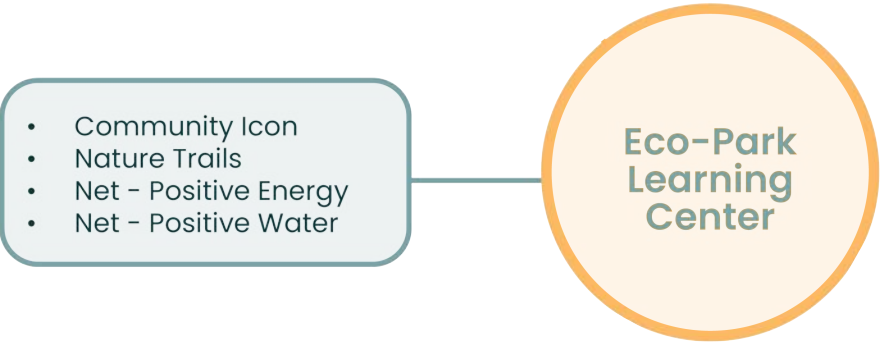


Financial Feasibility & Affordability

Municipal Space Expansion
Extraordinary Environmental Enterprise (E4) Participant
Startup Space
University & Research Partnerships

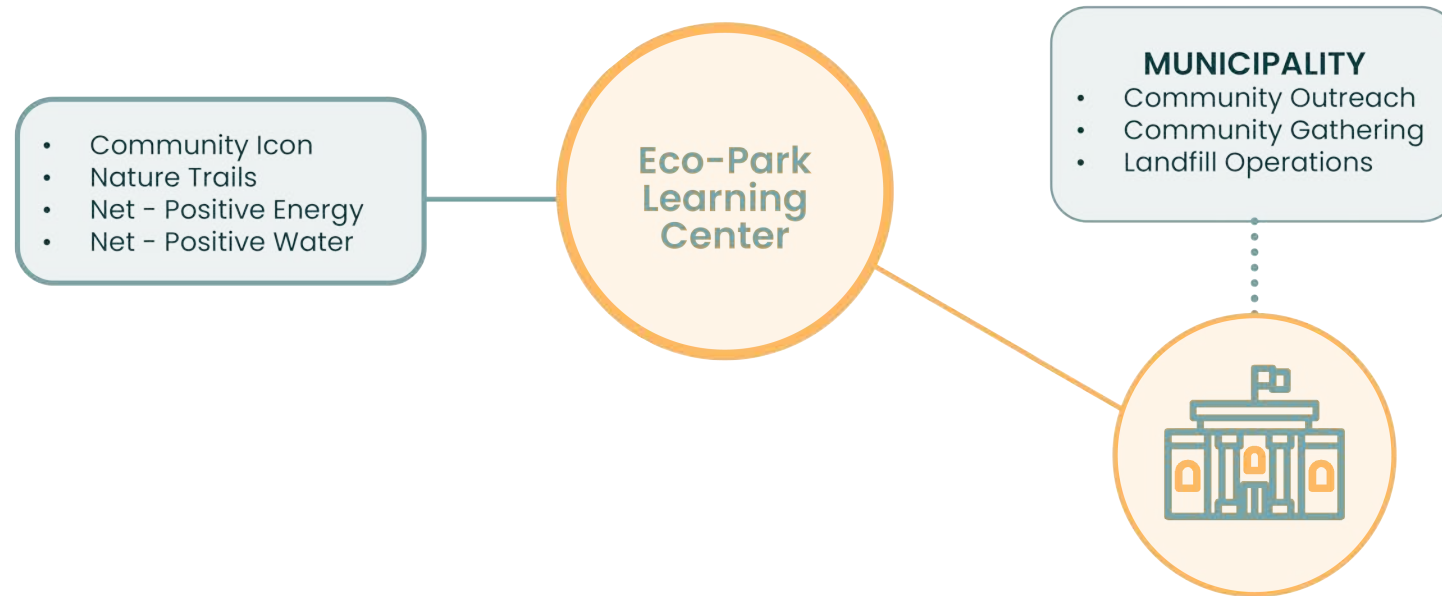


Market Potential



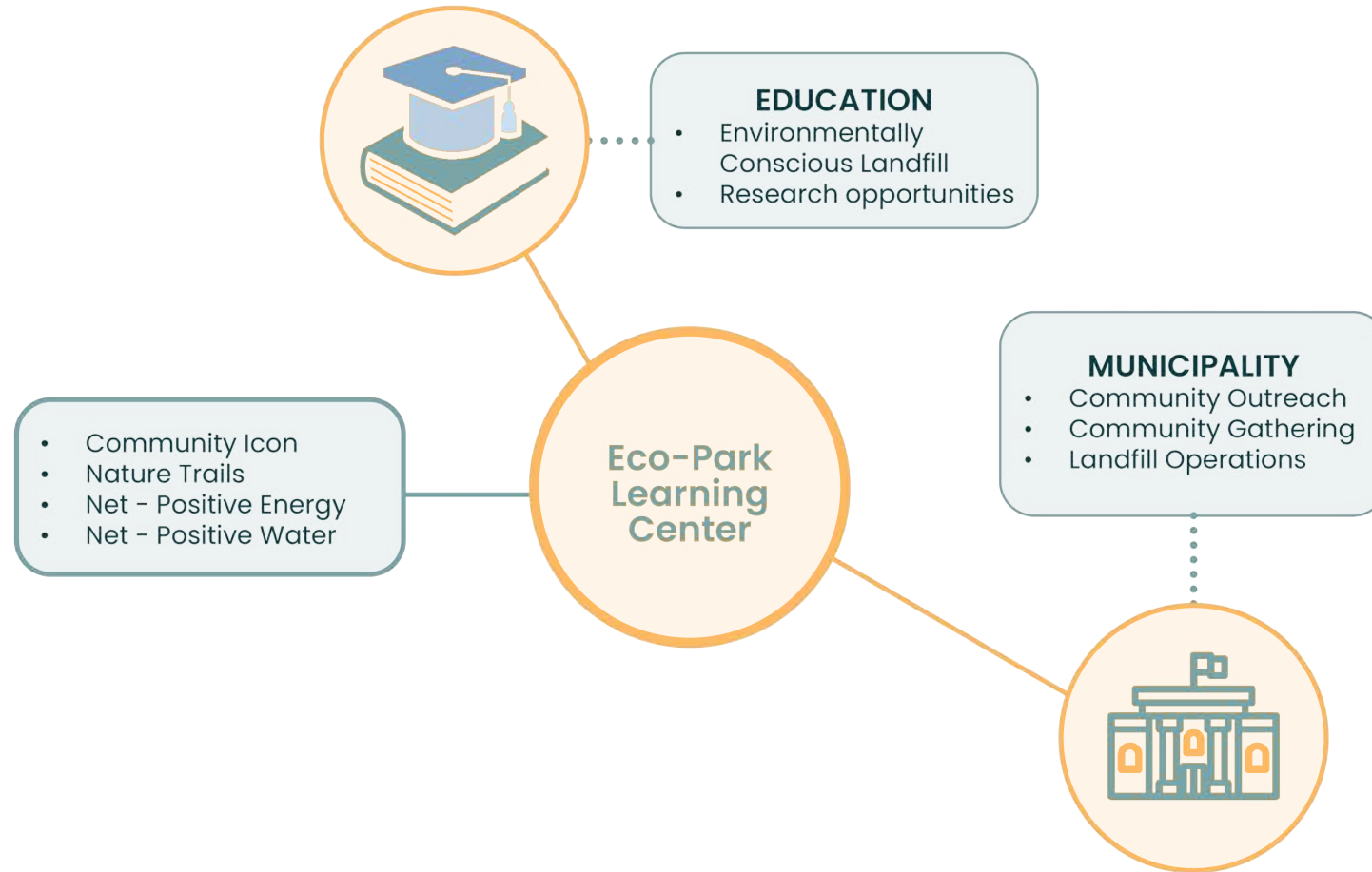


Market Potential



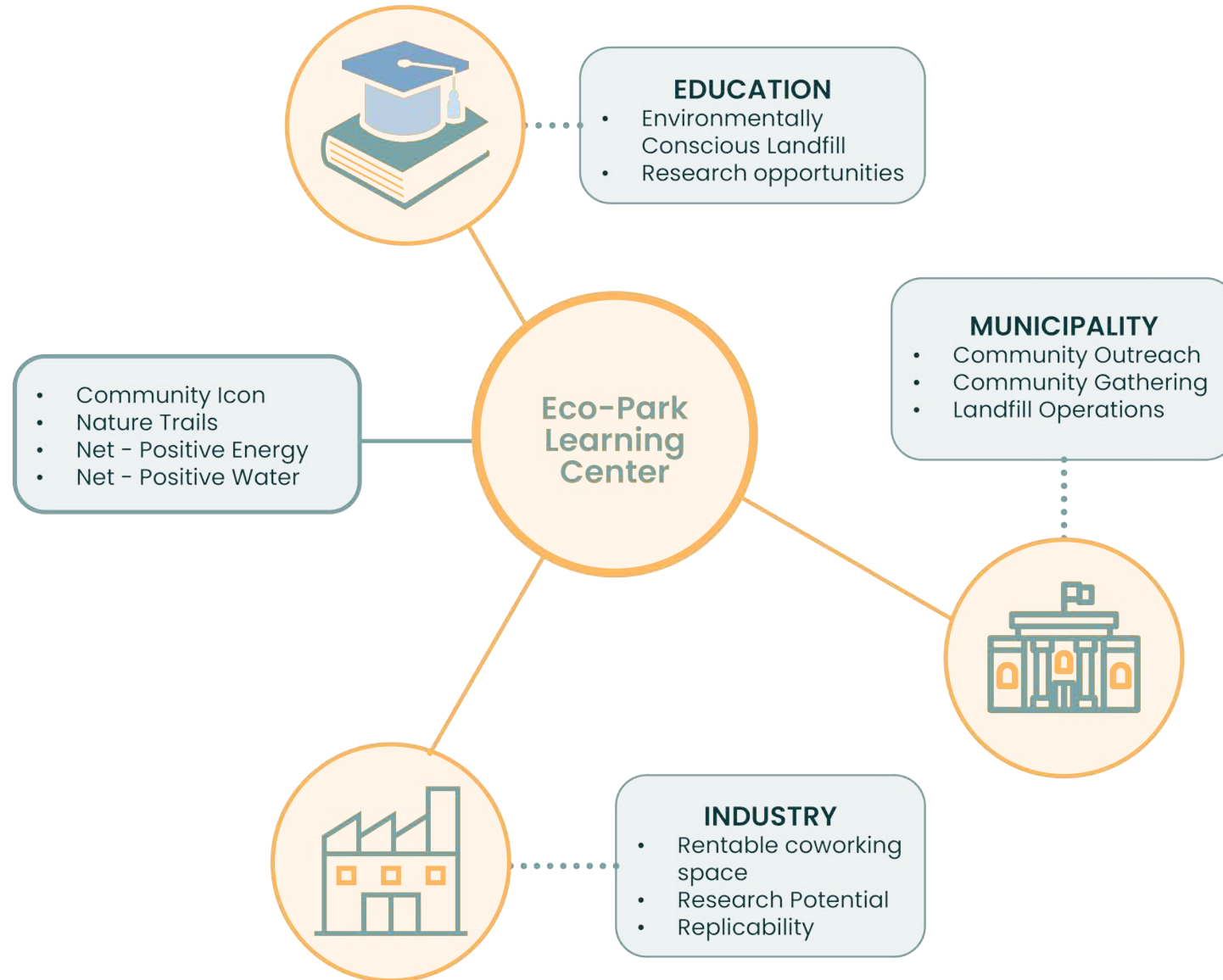


Market Potential





Market Potential





Market Potential



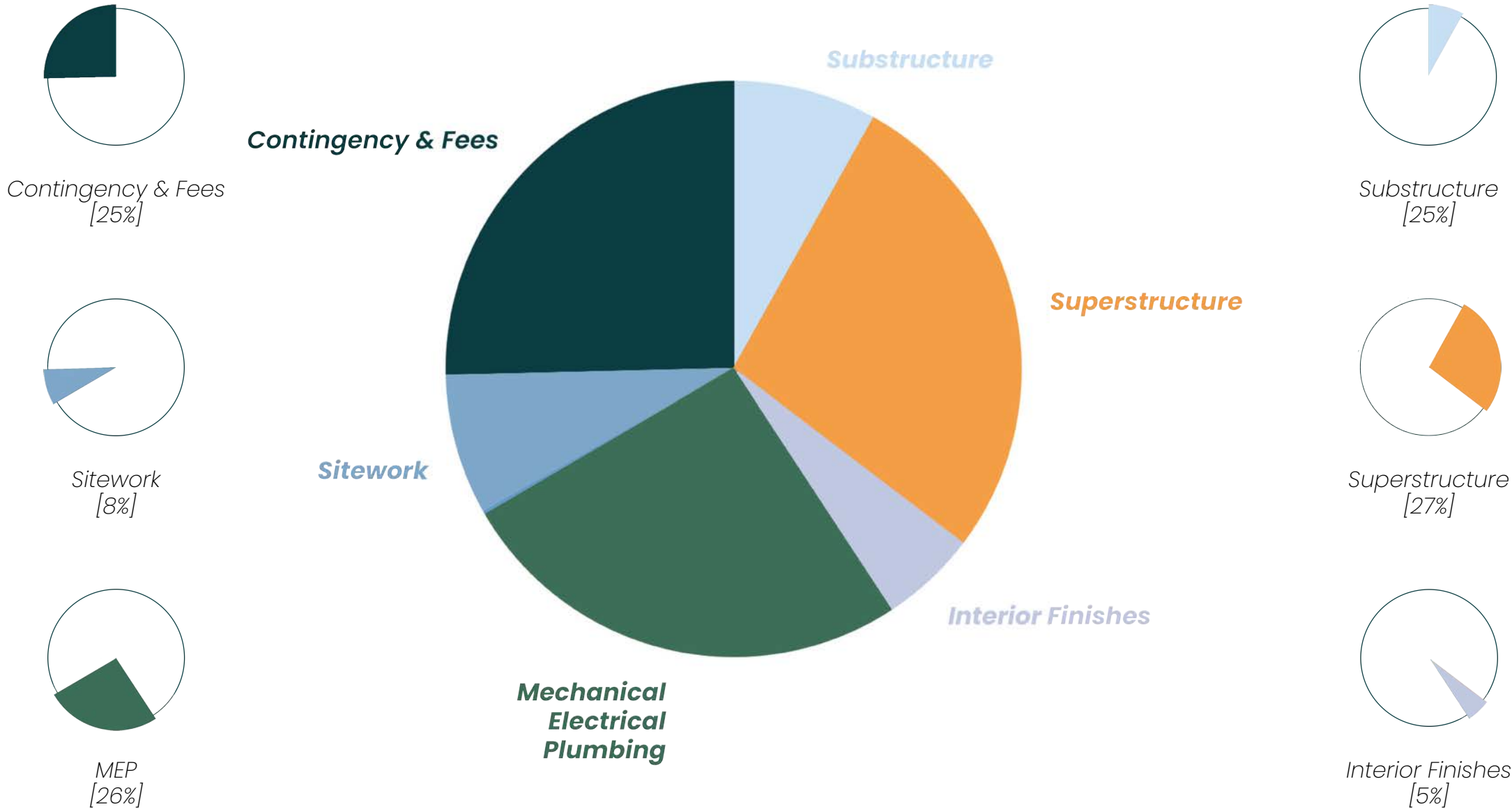
***Financial Feasibility &
Affordability***

Minimize Operation Costs
Material Selection
Potential Income



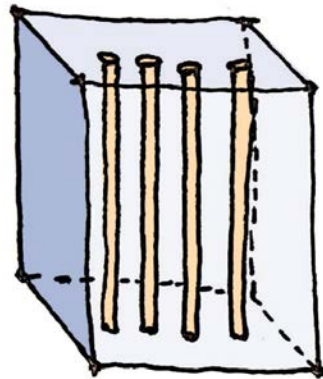
Innovation

Cost Breakdown

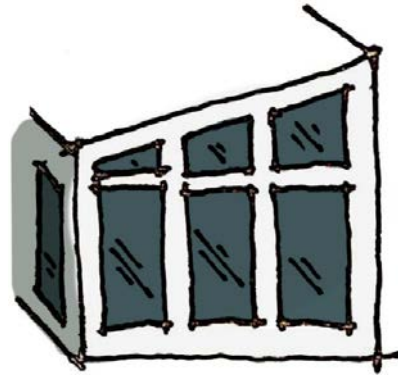




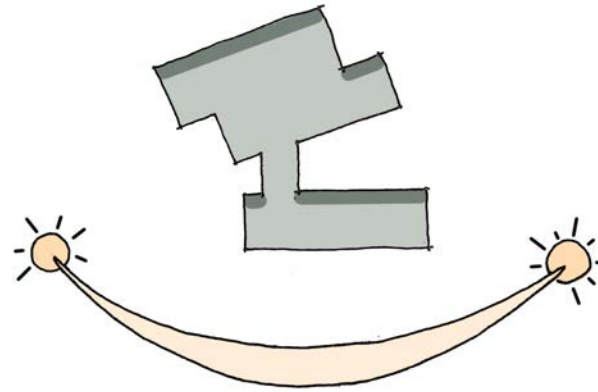
Cost Benefit Analysis



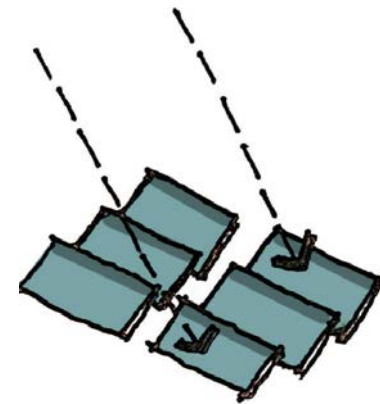
Four-Pipe
Fan Coil System



Glazing System



Building Position
and Solar Shading

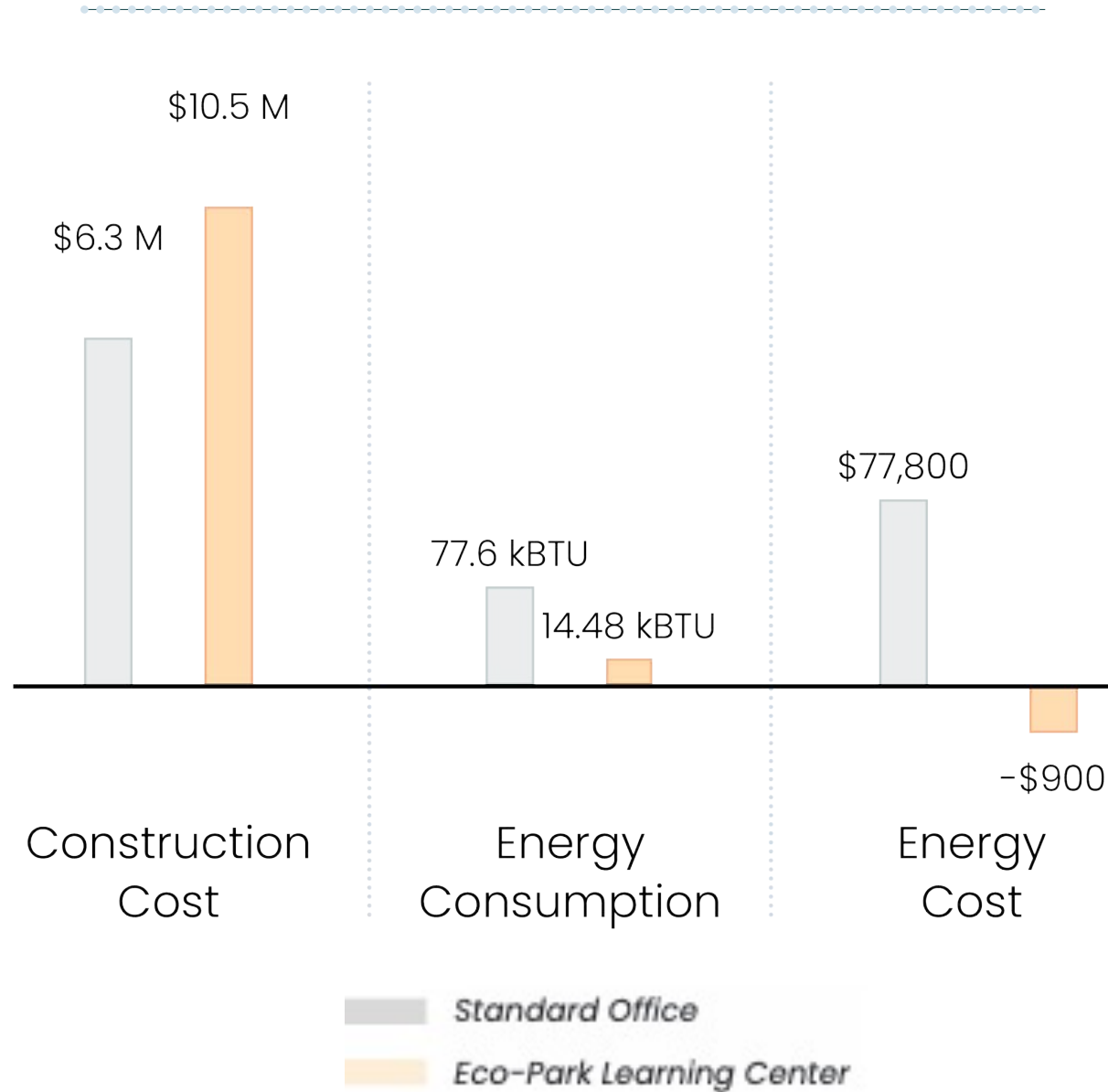


Solar Array



Rainwater
Harvesting

Cost Comparison



Architecture

Comfort &
Environmental

Engineering

Operations

Energy
Performance

Resilience

Market
Potential


Financial
Feasibility &
Affordability

Innovation

Rentable Space





Rentable Space

Community

Large Gathering Area
Access to Outdoor Gathering Areas
Kitchen & Bar





Rentable Space

Education

3 Multipurpose Rooms
Access to Outdoor Educational Areas



Rentable Space

Office

Open Office Space

8 Closed Offices

Central Kitchen & Break Areas





***Financial Feasibility
& Affordability***

Innovation

Conclusion

Embodied Energy
Material Selection
Saving a Stream



Responsible Interior Materials

CLT Interior
Wall Finish

Quartz
Countertop

Hardwood
Flooring

Recycled
Carpet

Green
Wall

Earth
Brick



Embodied Energy

Process

LF or SF
Measurement

x

PLF or PSF
Amount

x

Embodied
Energy
(Mj/kj)

x

Conversion
Factor
(430)

=

Total
Embodied
Energy
(BTU/lbs)

Structure

Steel Structure

22.8 Million

Glulam Structure

10.5 Million



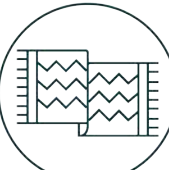
Enclosure

Traditional Brick

36.1 Million

Compressed
Earth Block

11.6 Million



Finishes

Standard Carpet

250.2 Million

Carbon Neutral
Carpet Tile

0 Million



Responsible Landscape Materials

Reclaimed
Log Posts



Reclaimed
Wood
Decking



Prairie
Grasses



Recycled
Glass Brick
Pathway



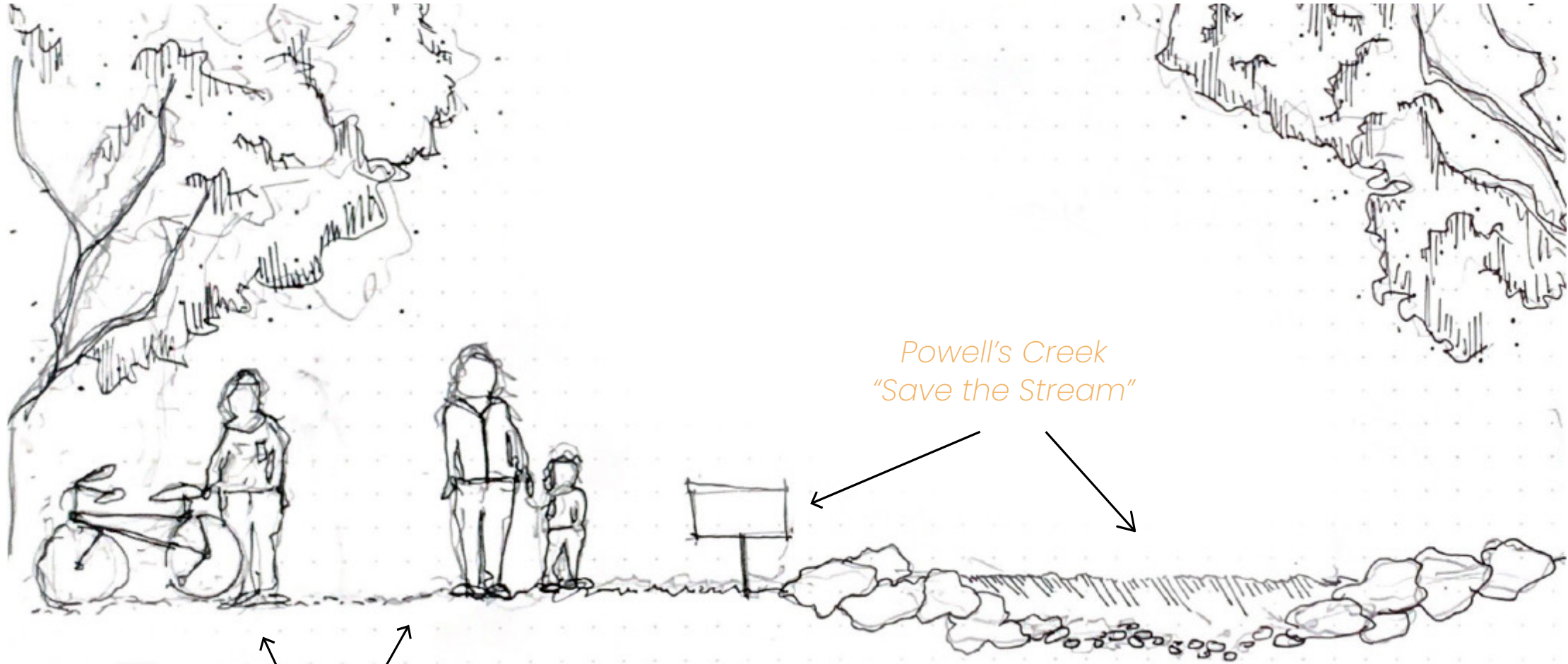
Earth
Blocks



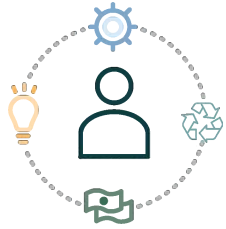
Glass
Aggregate
Concrete



Saving a Stream



Bike Share &
Woodland Trail System



Innovation

Conclusion

The Four C's [Design Goals]



Conservation

Preserve Existing Ecology

Use of Reclaimed Materials

iTree Analysis



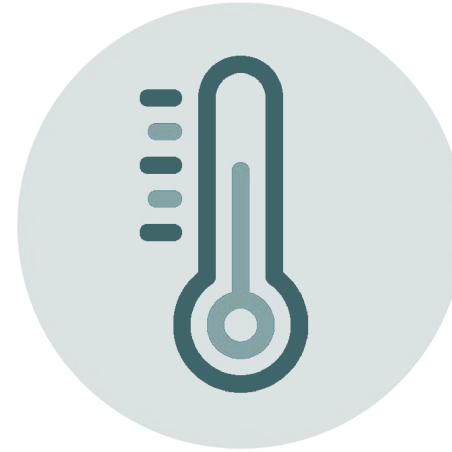
Community

Showcase to School Groups

Encourage Green Communities

Locally Sourced Green Roof

Scenic Walk/Bike Paths



Comfort

Individual Thermal Zones

Low Velocity HVAC

Radiant Floors

Natural Daylighting

Material Selection



Cost Awareness

Intelligent Constructability

Financially Attainable

Low Operational Costs



Mount Trashmore, Virginia



Hiriya Park, Israel



Freshkills Park, New York



Prince William County Landfill



Eco-Park Learning Center